Los Angeles Congestion Reduction Demonstration (LA CRD) ExpressLanes Program

National Evaluation:

Technical Memorandum on Congestion, Tolling, Transit, and Equity Results

www.its.dot.gov/index.htm
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Abstract

The Los Angeles County Metropolitan Transportation Authority (Metro), in partnership with the California Department of Transportation (Caltrans), serves as the Lead Agency for the I-110 and I-10 ExpressLanes Pilot Program. The program is funded by a United States Department of Transportation (U.S. DOT) Congestion Reduction Demonstration (CRD) grant. February 23, 2014 marked the completion of the federal grant requirement of 12 months of concurrent toll operations of the ExpressLanes. Now that the federal demonstration period is complete, the Metro Board will consider whether or not toll operations should continue beyond the current tolling authority expiration date of January 15, 2015. Once the determination is made, the program must be introduced during the California Legislative Session. Due to the Legislative Session calendar, the Metro Board must make the determination in April 2014 to allow sufficient time for full consideration by the Legislature. The purpose of this early results memo is to respond to Metro's request for an assessment from the Federal Highway Administration (FHWA) national evaluation team on the performance of the Pilot Program to assist the Metro Board when they consider the future of the Pilot Program during the month of April 2014.

The Memo covers the main topics of Congestion Analysis, Tolling Analysis, Transit Analysis, and Equity Analysis based on the latest available data. Although preliminary, the results described in this report suggest that many of the strategies deployed are accomplishing their goals and objectives. There remain areas where adjustments are warranted in an effort to improve performance. While the one year demonstration period recently ended, there are many policy related strategies that are yet to be considered for addressing the trends that have been identified through the data analysis on the two facilities. Over time, the local partners will work closely together to consider policies to apply to the ExpressLanes to further enhance performance.

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Executive Summary

The Los Angeles Congestion Reduction Demonstration (LA CRD), also known as the ExpressLanes Program is one of six sites funded by the United States Department of Transportation (U.S. DOT) through the Urban Partnership Agreement (UPA) and CRD program to demonstrate congestion pricing and other supporting strategies. This Technical Memorandum on Congestion, Tolling, Transit, and Equity Results presents evaluation findings based on baseline and available post-deployment data. A comprehensive evaluation report for the LA CRD deployment is currently being prepared by the National Evaluation Team and will be completed in the fall of of 2014.

The LA CRD (ExpressLanes) Program effort is led by the Los Angeles County Metropolitan Transportation Authority (Metro) in partnership with the California Department of Transportation (Caltrans). The CRD projects are being implemented with the assistance of a number of supporting agencies including the Los Angeles Department of Transportation (LADOT); Gardena Municipal Bus Lines; Torrance Transit; the Southern California Regional Rail Authority (Metrolink); Foothill Transit; and the California Highway Patrol (CHP).

Prior to the ExpressLanes Program, the High Occupancy Vehicle (HOV) lanes on Interstate 10 (I-10) and Interstate 110 (I-110) were experiencing challenges with degradation of the facilities. The original LA CRD proposal for converting the HOV lanes into High Occupancy Toll (HOT) lanes included a plan to increase the occupancy requirement in order to provide excess lane capacity to sell to ineligible drivers. However, existing policies did not allow for changes to the occupancy requirement. Therefore, existing occupancy requirements were used during the pilot period. The LA CRD grant also awarded funding to several complimentary strategies which support enhanced transit, technology and travel demand measures.

Tolling on the I-10 and I-110 corridors provides drivers with the choice of paying to use the HOT lanes or to stay in the general purpose lanes toll-free. This choice may largely depend on the value placed by travelers on the trip. In addition, travelers have another choice - to get out of their vehicles. The LA CRD investments in transit, technology and travel demand measures provide travelers with increased availability to transit, carpools, and vanpools. The purpose of the analysis reported in this document, is to determine whether the LA CRD strategies applied along the I-10 and I-110 corridors and downtown Los Angeles, were successful in four key areas: (1) congestion reduction, (2) improved transit ridership, (3) travel time savings, and the (4) mitigation of potential equity impacts.

The centerpieces of the LA CRD are the ExpressLanes along the I-10 and I-110 freeways.[1] The ExpressLanes were intended to improve overall system performance in the two corridors by permitting toll-paying vehicles that do not meet the carpool occupancy requirements to use remaining HOT lane capacity on the I-10 and I-110 freeways. The I-110 ExpressLanes span 11 miles and include two lanes in each direction of travel from the I-105 to Exposition Blvd. The I-10 ExpressLanes span 14 miles and as part of the demonstration program a second lane was added from I-605 to I-710 (covers

[1] ExpressLanes were created by converting existing high occupancy vehicle (HOV) lanes into HOT lanes along the I-10 (from I-605 to Alameda Street) and along the I-110 (from 182nd Street to Adams Boulevard). In addition, a second HOT lane was created (via restriping; no loss of general purpose lanes occurred) on I-10 from I-605 to I-710.

nine miles). During the demonstration period, all vehicles were required to pay to use the ExpressLanes with the exception of publicly or privately operated transit vehicles, motorcycles, and multiple-occupant private vehicles (three or more occupants on I-10 during peak hours, two or more all other times; two or more occupants on I-110). Upon completion of the demonstration period (effective February 24, 2014), alternative fuel vehicles with white and green California Clean Air Stickers were allowed to travel toll-free irrespective of occupancy with a FasTrak transponder. Tolls range from a minimum $0.25 per mile to a maximum $1.40 per mile depending on congestion levels. When travel speeds in the ExpressLanes fall below 45 mph for more than ten minutes, the ExpressLanes have reached capacity. At this point, the lanes revert to HOV lanes and vehicles that do not meet the carpool occupancy requirements are not permitted to "buy" their way into the lanes. Qualifying low income commuters receive a $25 credit when they set up their account through the Equity Plan.[2]

The other LA CRD strategies that are being evaluated include transit improvements to increase the frequency of Metro bus rapid transit service through the acquisition of new clean fuel expansion buses and increased service, security upgrades, construction improvements along stations, additional capacity along park-and-ride lots and implementation of transit priority system technology to facilitate ExpressLanes traffic movement where the I-110 enters downtown Los Angeles. Additionally, the intelligent parking management (IPM) ("LA ExpressPark"), a variable and demand-based parking pricing system, is being implemented to reduce traffic congestion, reduce air pollution, and improve transit efficiency by reducing parking search times. Note that this strategy will be discussed in the final report and has not been included in this tech memo. Lastly, ridesharing promotional efforts are being conducted to increase the number of registered vanpools (with a goal of 100 new registered vanpools on the I-10 and I-110 corridors).

Although preliminary, the results described in this report suggest that the LA CRD projects are accomplishing many of their goals and objectives. Consistent with other new HOV/HOT conversion projects, the congestion data analysis shows degradation in travel times and travel speeds performance during the initial deployment period on some portions of the I-10 and I-110. However, consistent with other sites, the same facilities are showing an upward trend in travel time reductions and increases in speed in the later portions of the pilot period. The tolling analysis findings indicate that the number of trips on the ExpressLanes (by all groups) continued to increase over the course of the demonstration period, partially demonstrated by the increase in gross revenue from toll-paying vehicles. The many incentive programs proved to be successful with almost $13,000 in toll credits issued to Transit Rewards Program account holders and over $100,000 in toll/transponder credits issued to over 4,000 LA County households enrolled in the Equity Plan. In addition, the ExpressLanes program surpassed several of its goals including; enrolling over 100 new Metro-registered vanpools and issuing over 253,000 transponders by the end of the demonstration period.

Transit analysis findings indicate that Silver Line ridership increased largely due to CRD-funded services. The entire line (both I-110 and I-10) showed a 27 percent increase in monthly boardings after the new service was added with an additional 15 percent increase post-tolling. When surveyed, a third of new riders said they drove alone prior to the increased services and 48 percent of riders agreed that tolling has improved their travel. Additionally, the surveys showed an overall good level of customer satisfaction with transit services. Other LA CRD projects have also proven successful with commuters taking advantage of the increased parking capacity that has been offered. The equity analysis showed that Metro's re-investment of net toll revenues promotes equity. Findings showed that the number of FasTrak accounts and Equity Plans continued to grow throughout the post-

[2] The Equity Plan defines low income commuters as Los Angeles residents with an annual household income (family of 3) of $39,060 or less (numbers based on 2013 income levels per the demonstration period).

deployment period and that Equity Plan users made more monthly trips in the ExpressLanes than overall ExpressLanes users. 80 percent of the trips made by Plan users were toll-free. In addition, when surveyed Equity Plan users felt that the credit provided was important in making the decision to get a FasTrak account to use the ExpressLanes. More specific findings are summarized below:

- **Congestion Analysis** – The congestion analysis assessed changes in traffic performance on the I-110 and I-10 ExpressLanes and general purpose lanes at the end of the one year demonstration period. Changes in travel times, trip speeds, and peak-hour vehicle and person throughput were included in this analysis.

  Travel Time: Caltrans' floating car travel time studies were used to examine how vehicle travel times changed between the pre- and post-deployment evaluation periods. These studies were performed during the Spring, Summer, and Fall of 2012 and 2013.

  I-10 Travel Time: The results showed the I-10 ExpressLanes experiencing a 2 minute reduction in travel times during both the morning and evening commute periods (as shown in Table ES-1). Travel times in the general purpose lanes also declined by approximately 2 minutes during the morning commute, but increased by over 4 minutes during the evening commute in the post deployment period.

Table ES-1. Changes in Travel Time After CRD Improvements (in mins).

Facility	Peak Period (Direction)	Express Lanes	General Purpose Lanes
I-10	Morning (WB)	-2.19	-1.89
	Afternoon (EB)	-2.00	4.31
I-110	Morning (NB)	1.89	-0.02
	Afternoon (SB)	0.11	1.67

Source: Caltrans

I-110 Travel Time: The results also showed that travel times in the I-110 ExpressLanes increased by approximately 2 minutes during the morning commute but remained near their pre-deployment levels in the evening commute. Morning commute travel times on the I-110 general purpose lanes remained close to pre-deployment levels. Travel times in the evening commute period in the southbound direction on I-110 remained close to pre-deployment levels, increasing by only 0.11-minutes on the ExpressLanes and by approximately 1.7 minutes in the general purpose lanes.

Average Trip Speeds -- I-10

Morning Commute Period (a.m.) -- Westbound

Year	General Purpose Lanes								ExpressLanes							
	5:00	5:30	6:00	6:30	7:00	7:30	8:00	8:30	5:00	5:30	6:00	6:30	7:00	7:30	8:00	8:30
Pre- Deployment	NA	59	45	30	23	21	21	23	NA	64	60	57	48	40	53	52
Post- Deployment	NA	55	39	27	23	24	27	28	NA	66	62	61	60	58	58	59

Afternoon Commute Period (p.m.) -- Eastbound

Year	General Purpose Lanes								ExpressLanes							
	3:00	3:30	4:00	4:30	5:00	5:30	6:00	6:30	3:00	3:30	4:00	4:30	5:00	5:30	6:00	6:30
Pre- Deployment	28	26	27	25	25	26	29	36	46	44	41	43	47	49	49	51
Post- Deployment	27	25	23	21	24	23	28	35	54	50	48	47	48	49	53	59

Source: Texas Transportation Institute based on data provided by Caltrans

Average Trip Speeds -- I-110

Morning Commute Period (a.m.) -- Northbound

Year	General Purpose Lanes								ExpressLanes							
	5:00	5:30	6:00	6:30	7:00	7:30	8:00	8:30	5:00	5:30	6:00	6:30	7:00	7:30	8:00	8:30
Pre- Deployment	NA	62	40	25	18	19	21	25	NA	65	65	57	50	44	53	59
Post- Deployment	NA	55	35	27	20	20	21	24	NA	64	59	49	37	47	47	45

Afternoon Commute Period (p.m.) --Southbound

Year	General Purpose Lanes								ExpressLanes							
	3:00	3:30	4:00	4:30	5:00	5:30	6:00	6:30	3:00	3:30	4:00	4:30	5:00	5:30	6:00	6:30
Pre- Deployment	45	40	38	34	35	35	34	35	65	64	63	62	61	59	58	62
Post- Deployment	38	37	36	34	31	32	31	35	65	65	65	63	60	60	59	62

Source: Texas Transportation Institute based on data provided by Caltrans

Travel Speed: The National Evaluation Team also examined changes in average travel speeds in the

ExpressLanes and general purpose lanes between the pre-and post-deployment period.

I-10 Travel Speed: Prior to the LA CRD improvements, ExpressLanes and general purpose lanes trip speeds averaged approximately 53 mph and 31 mph, respectively, in the westbound direction on I-10 during the morning commute. Following full deployment of the LA CRD improvements, average trip speeds on the general purpose lanes remained at 31 mph, while average trip speeds in the ExpressLanes increased above 55 mph. For the evening commute, trip speeds on I-10 in all lanes showed a slight improvement over pre-deployment levels.

I-110 Travel Speed: The analysis also found that average trip speeds in the general purpose lanes during the morning commute on I-110 decreased in the post-deployment period. The analysis showed that in the pre-deployment period, the ExpressLanes operated with average trip speed of less than 45 mph from 7:30 to 8:00 a.m. In the post-deployment period, average trip speeds in the I-110 ExpressLanes operating near or below 45 mph from 6:30 a.m. to 9:00 a.m. In the evening commute, the ExpressLanes on I-110 continued to operate with relatively faster trip speeds compared to the general purpose lanes.

Throughput: The National Evaluation Team also examined the change in peak hour vehicle and passenger throughput in the post-deployment period. Caltrans vehicle occupancy counts provided a limited set of data from which to investigate peak-hour vehicle and person-throughput.

Table ES-2. Change in Total Peak-Hour Vehicle Throughput.

Peak Period	Location	Total Peak-Hour Vehicle Throughput			
		Pre-Deployment	Post-Deployment	Change	% Change
I-10					
AM (WB)	Warwick	8598	7452	-1146	-13.3
	Jackson	5817	7125	1308	22.5
PM (EB)	Warwick	6759	6594	-165	-2.4-
	Jackson	7752	7558	-194	-2.5
I-110					
AM (NB)	Adams	8522	9209	687	-2.6
	Slauson	8182	8115	-67	-0.8
PM (SB)	Slauson	8639	9262	623	7.2

Source: Caltrans

Table ES-3. Change in Total Peak-Hour Person Throughput.

Peak Period	Location	Total Peak-Hour Person Throughput			
		Pre-Deployment	Post-Deployment	Change	% Change
I-10					
AM (WB)	Warwick	13148	10621	-2527	-19.2
	Jackson	11006	10170	-838	-7.6-
PM (EB)	Warwick	10467	10394	-73	-0.7
	Jackson	10728	11387	659	6.1
I-110					
AM (NB)	Adams	12410	12082	-328	-2.6
	Slauson	12256	10737	-1519	-12.4
PM (SB)	Slauson	13135	13111	-24	-0.2

Source: Caltrans

Vehicle Throughput: From on the limited data samples available to the evaluation team, the analysis showed that total peak hour vehicle throughput remained relatively constant or increased slightly in both the I-10 and I-110 corridors in the post-deployment period. The analysis found that on both the I-110 and I-10 peak hour vehicle throughput in the ExpressLanes increased in the post-deployment period.

Person Throughput: Also using the Caltrans vehicle occupancy counts, the National Evaluation Team also examined changes in peak hour person throughput between the two evaluation periods. The preliminary findings for this analysis showed that person throughput on I-110 in the northbound direction during the morning peak hour decreased by 12.4 percent in the post-deployment period. This reduction correlates with the reduction in vehicle travel times and trips speeds observed on I-110 for the morning commute. The data also showed that for the I-10, total peak period person throughput declined in the morning commute, but increased in the evening commute. It should be noted that during the evaluation study, I-10 was under construction, which may have caused some users to change how they used the facility. Additional analyses will be performed in the final report to explore better data sources for capturing the changes in vehicle and person throughput experienced in these corridors due to the CRD improvements.

- **Tolling Analysis** – The tolling analysis examined the expansion and conversion of the existing HOV lanes on the I-110 and I-10 corridors into HOT lanes. Information on the use of the I-110 ExpressLanes from November 2012 through December 2013 and the I-10 ExpressLanes from February 2013 through December 2013 is presented. Enforcement, toll transactions, toll rates, and toll revenues on the ExpressLanes are also discussed. A total of 204,155 accounts were opened during the 19-month period from July 2012 to January 2014, with 253,139 transponders issued, surpassing the goal of 100,000 active transponders by the end of the demonstration period.

  The I-110 and I-10 ExpressLanes use FasTrak, an electronic toll data collection system allowing drivers to travel through designated FasTrak-only lanes without stopping. Individuals must have a switchable FasTrak transponder to travel as a toll-free carpool in the I-110 and I-10 ExpressLanes. Motorists set the transponder switch to the position corresponding with the number of occupants (1, 2, or 3+) before entering the lanes. The number of trips on the ExpressLanes by all groups – self declaring toll-free HOV2s /HOV3s, toll-paying HOV2s and SOVs, as well as vanpools, buses, motorcycles, and other exempt vehicles – increased over the course of the demonstration. The results indicate that the ExpressLanes are providing choices to travelers in the I-110 and I-10 corridors.

  The Equity Plan, the Carpool Loyalty Program, the Transit Rewards Program, and the Vanpool Program provide additional incentives and benefits to ExpressLanes carpoolers, bus riders, and vanpoolers. As of the end of December 2013, a total of 4,329 Los Angeles County households were enrolled in the Equity Plan, accounting for $108,225 in toll/transponder credits. The Carpool Loyalty Program automatically enters ExpressLanes FasTrak account holders using the lanes as a carpooler into monthly drawings for gift cards. During the demonstration period, 520 gift cards were issued. The Transit Rewards Program allows frequent bus riders using their registered TAP card to earn a $5 toll credit by taking 32 one-way trips during the peak hours on the I-110 and I-1 ExpressLanes. During the demonstration period,

5,782 accounts were enrolled in the program, earning $12,870 in toll credits. A total of 117 vanpools using either or both the I-110 and I-10 ExpressLanes, were established from July 2012 through February 2014, surpassing the goal of 100 new vanpools.

Both electronic and manual visual enforcement are used on the I-110 and I-10 ExpressLanes. The FasTrak system records vehicles without an active transponder. After the initial 60- days of operation on the I-110 ExpressLanes and the I-10 ExpressLanes, when a grace period was in effect and no violation penalties were assessed, the violation rates on both facilities during the AM peak hour peak direction of travel ranged from 6 percent-to-7 percent. A combination of electronic monitoring and visual enforcement is used to address violations of the self-declared occupancy requirements by CHP officers providing extra enforcement on the I-10 and I-110 ExpressLanes during the morning and afternoon peak periods. During the demonstration period, the monthly number of verbal warnings on the I-110 ExpressLanes ranged from 57-to-133, with the monthly number of citations ranging from 108-to-201. On the I-10 ExpressLanes, the monthly number of verbal warnings ranged from 77-to-164, and the number of citations ranged from 113-to-226. The differences in the manual occupancy counts conducted by Caltrans and the self-reporting FasTrak transponder data are being examined in more detail by Caltrans and Metro.

The gross revenue from toll-paying vehicles not meeting the carpool occupancy requirements using the I-110 and I-10 ExpressLanes for the 14-month period from November 2012 through December 2013 reflects the changes in use of the ExpressLanes. Total gross revenues for the 14-month period were $16,157,700 on the I-110 ExpressLanes and $7,234,593 on the I-10 ExpressLanes, for an overall total of $23,392,293. These figures do not include revenue from toll violations, violation penalties, and other fees.

- **Transit Analysis** – The transit analysis evaluated the impact transit enhancements funded through the LA CRD Program had on ridership and whether it facilitated a mode shift to transit contributing to congestion mitigation. The analysis for this technical memo includes data from June 2010 to November 2013.

  Analysis shows that bus travel times on both the I-10 and I-110 ExpressLanes improved by 1.5 minutes during the morning peak period. Since activation of the transit priority system (TPS) on Figueroa Street, bus travel times improved by 0.2 minutes and on Flower Street, travel times improved from 0.1 minutes post-TPS. The changes are small enough that it is not likely to have been noticeable to riders.

  CRD funds were also used to enhance the service frequency of the Silver Line well before the start of tolls on I-110 and I-10. A significant finding of the transit analysis is that the enhanced service resulted in a mode shift which included a significant increase in Silver Line ridership. There was a 27 percent increase in monthly boardings on the Silver Line after the new service was added and another 15 percent increase after tolls were implemented, for the entire line (both I-110 and I-10). When restricting the analysis to just the I-110 portion of the Silver Line, which is where the new service was added, the results are even more dramatic. Average daily ridership in the morning peak period increased 52 percent after the new service and 29 percent after tolls. In the afternoon peak period, it increased 41 percent after the new service and 25 percent after the tolls were implemented.

The municipal transit operators introduced their new service close to the opening of the ExpressLanes. Therefore, it is difficult to distinguish how much of the increase in ridership on their routes was due to the new service and how much was due to the introduction of tolling. The Silver Streak, operated by Foothill Transit on I-10, saw a 59 percent increase in morning peak period ridership after tolling and a 15 percent increase in the afternoon peak period. The Route 699, also operated by Foothill Transit, saw morning peak period ridership drop by 13 percent but afternoon peak period ridership increase by 54 percent. The drop in morning riders may be due to shifting to the Silver Streak for the morning commute. Peak period ridership on the Gardena Transit Line 2, which is a feeder service into the Silver Line, increased 3 percent in the morning and 12 percent in the afternoon. At the time of this report, ridership data was not available for the Torrance Line 4 but will be included in the final report.

As a result of investments in park-n-ride lot expansions, at the Pomona Metrolink Station, more commuters are taking advantage of the increased parking capacity. In March 2010, prior to the expansion, all 230 spaces were occupied. In March 2013, 347 out of 372 spaces were occupied (93%). More commuters are taking advantage of the increased capacity at the El Monte Station too. In March 2011, 1,099 of the 1,105 spaces were occupied (99%). In March 2013, 1,146 of the 1,419 spaces were occupied (81%). At the lots in the I-110 corridor, the total number of occupied spaces increased 13 percent from 810 in March 2012 to 913 in March 2013. The lots at Harbor Gateway Station and Harbor Freeway Station were the two greatest sources of additional parked cars.

The evaluation included three surveys of Silver Line riders (2011, 2012, and 2013). A significant positive finding from the last survey (2013) was that about a third of the new riders said they used to drive alone. There were some changes in customer satisfaction that were statistically significant. On the I-110, there were statistically significant improvements in the customer satisfaction ratings for frequency of service and hours of service but also statistically significant decreases in the customer satisfaction ratings related to parking availability and availability of seats. The latter two may have been caused by the increase in ridership. On the I-10, there were statistically significant decreases in the customer satisfaction ratings for travel time, ability to connect to other services, and overall satisfaction. However, in all three categories, the ratings still fell within the range of "Good". Among Silver Line riders who began taking the bus after tolling started, a little more than a third said the ExpressLanes conversion influenced them to take transit (37% on the I-110 and 34% on the I-10). A majority of riders report that their travel times have gotten shorter since tolling began (65% on the I-110 and 56% on the I-10). In both corridors, 48 percent agreed that tolling the I-110 and I-10 ExpressLanes has improved their travel. Another 34 percent were neutral. In regards to the issue of equity, slightly more than half agreed that the tolls on I-110 and I-10 are unfair to people on limited incomes. In the I-110 corridor, it was 54 percent. In the I-10 corridor, it was 55 percent. About a third of the respondents were neutral.

- **Equity Analysis** – This analysis examined potential equity concerns associated with the ExpressLanes projects. It assessed whether the positive or negative effects of the ExpressLanes fell disproportionately on different user groups, as well as different geographic areas. When examining available findings to date, transit riders, general purpose lane users, and HOV users who remained in the same user group from the pre-deployment period to the post-deployment period experienced no major change.

Results from the Metro Equity Plan Survey showed that the credit from the Equity Plan was important for over 82 percent of the respondents in making the decision to get a FasTrak account to use the ExpressLanes. Data on FasTrak accounts, Equity Plans, and the number of tolled and HOV 2+ trips on the I-110 and I-10 ExpressLanes showed that the number of FasTrak accounts and Equity Plans continued to grow throughout the post-deployment period. The analysis showed that users with an Equity Plan made more monthly trips in the ExpressLanes than overall ExpressLanes users, averaging 12.2 trips per month versus 10.6 trips per month for all users. However, over 80 percent of trips taken by users with Equity Plans were toll-free trips (HOV 3+ on the I-10 during peak periods, and HOV 2+ on the I-10 for non-peak periods and the I-110 at all times). Overall, Equity Plans accounted for only 1.2 percent of tolled trips on the I-10 and I-110 ExpressLanes, but 3.8 percent of free trips. Finally, single-occupant vehicles that used the ExpressLanes from November 2012 to December 2013 paid an average toll of $2.33, while a single occupant vehicle with an Equity Plan paid an average toll of $1.92 in that same period.

When examining the spatial distribution of FasTrak accounts by zip code throughout the LA Metro area, it reveals that higher percentages of Equity Plan accounts tend to correspond with areas having low median household incomes and high rates of poverty. In many cases, the areas with higher percentages of equity plans are in a lower income area where fewer individuals obtained a FasTrak account.

Metro's policy for reinvestment of the ExpressLanes net toll revenues for diverse and multimodal projects promotes a positive, equitable impact. Equity across geographic areas is promoted by re-investing toll revenue only within the corridor from which the revenue was collected. Investments for pedestrian, transit, vanpool, and fare subsidy programs support equity for low-income users in the corridors. Highway improvements will likewise support drivers that utilize the ExpressLanes. Multimodal investments support all user groups within the corridors by enhancing the quality and quantity of transportation options available and reducing congestion in the corridors to further improve the travel experience. Further, multimodal investments also reduce adverse air quality impacts in the corridor, thereby promoting environmental equity. In conclusion, given the information presented above, the Metro policy for re-investment of net toll revenues appears promotes equity.

This technical memorandum focused on four of the eleven analysis areas that will be included in the final report due out in fall 2014. When evaluating these analysis areas, the team is aware that the effectiveness of the LA CRD strategies may be affected by exogenous factors. These factors include unemployment rates, gasoline prices, atypical travel conditions, and non-CRD transportation system changes. The final report will include a comprehensive analysis of the impact of these external factors. The National Evaluation Team found that, thus far, throughout the evaluation period gasoline prices have experienced minor fluctuations with a slight upward trend in cost and a slow decreasing trend in the unemployment rate for the LA metro area. In the final report, the changes in gasoline prices and unemployment rates will be overlaid against travel (i.e., traffic volumes, VMT) to see if both the travel data and the gas prices and unemployment rates follow similar trends. In addition, since the post-deployment period ended, the National Evaluation team began collecting data for the remaining two exogenous factors for assessing their impact on the LA CRD projects in the final report.

The LA CRD Program strategies were intended to improve overall system performance across the I-10 and I-110 corridors using tolling, transit, technology and travel demand management strategies. Although preliminary, the results described in this report suggest that many of the strategies deployed

are accomplishing their goals and objectives. There remain areas where adjustments are warranted in an effort to improve performance. While the one year demonstration period recently ended, there are many policy related strategies that are yet to be considered for addressing the trends that have been identified through the data analysis on the two facilities. Over time, the local partners will work closely together to consider policies to apply to the ExpressLanes to further enhance performance.

Chapter 1. Los Angeles Congestion Reduction Demonstration Technical Memorandum on Congestion, Tolling, Transit, and Equity Results

The Los Angeles Congestion Reduction Demonstration (LA CRD), also known as the ExpressLanes Program is one of six sites funded by the United States Department of Transportation (U.S. DOT) through the Urban Partnership Agreement (UPA) and CRD program to demonstrate congestion pricing and other supporting strategies. The national evaluation, led by Battelle, is examining the effectiveness of these strategies. February 23, 2014 marked the completion of the federal grant requirement of 12 months of concurrent toll operations on the ExpressLanes. Now that the federal demonstration period is complete, the Metro Board will consider whether or not toll operations should continue beyond the current tolling authority expiration date of January 15, 2015. Once the determination is made, the program must be introduced during the California Legislative Session. Due to the Legislative Session calendar, the Metro Board must make the determination in April 2014 to allow sufficient time for full consideration by the Legislature. This purpose of this memorandum is to respond to Metro's request for an assessment on the performance of the LA CRD Program to assist the Metro Board when they consider the future of the Pilot Program this month.

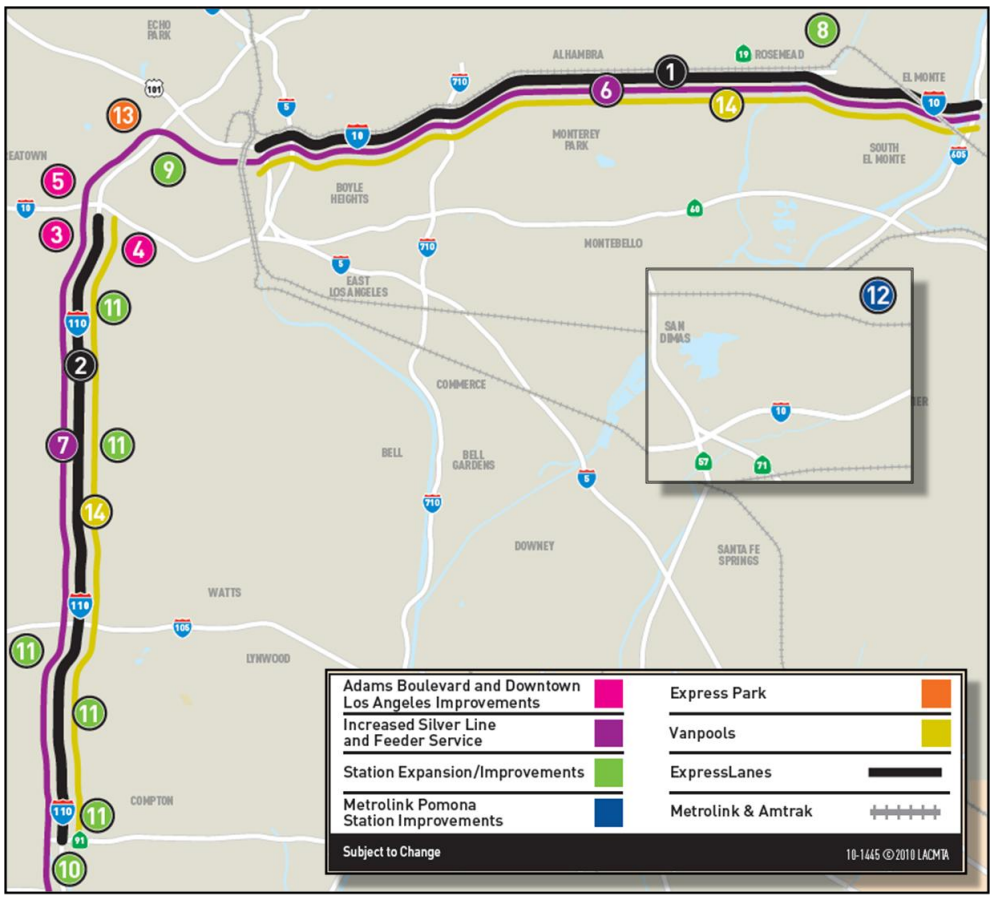
The LA CRD program includes eleven areas of analysis: tolling, technology, transit, ridesharing, congestion, safety, equity, environment, business impacts, non-technical success factors, and cost-benefit. Of these eleven analysis areas, four areas were identified by U.S. DOT and the Los Angeles local partners for inclusion in this report. These include: congestion, tolling, transit, and equity. This Technical Memorandum on Congestion, Tolling, Transit, and Equity Results presents evaluation findings based on baseline and available post-deployment data. The post-deployment data collection period ended in February and the National Evaluation Team recently began working on a comprehensive evaluation report for all of the LA deployments. The final evaluation report is scheduled for completion by the end of the year. Further information on the LA CRD ExpressLanes Program evaluation methodology can be found at http://www.upa.dot.gov/pub.htm.

This document is organized into three Chapters. Chapter 2 describes the LA CRD ExpressLanes Program in terms of the partners, projects, and strategies and the context in which the deployments took place. Chapter 3 presents the early results in the four areas of analysis selected for this report. Chapter 4 summarizes the major findings.

Chapter 2. The Los Angeles Congestion Reduction (ExpressLanes) Program

The LA CRD (ExpressLanes) Program effort is led by the Los Angeles County Metropolitan Transportation Authority (Metro) in partnership with the California Department of Transportation (Caltrans). The CRD projects are being implemented with the assistance of a number of supporting agencies including the Los Angeles Department of Transportation (LADOT); Gardena Municipal Bus Lines; Torrance Transit; the Southern California Regional Rail Authority (Metrolink); Foothill Transit; and the California Highway Patrol (CHP).

The LA CRD ExpressLanes Program projects are intended to reduce congestion, promote throughput, and enhance mobility in the I-10 and I-110 corridors and in downtown Los Angeles. Figure 2-1 shows the location of the LA CRD (ExpressLanes) Program projects and Figure 2-2 provides short summaries of the numbered projects on Figure 2-1.



Note: See Figure 2-2 for the explanation of each numbered project on this map.
Source: Derived from ExpressLanes project map.

Figure 2-1. LA CRD (ExpressLanes) Program Project Locations.

EXPRESSLANES

1. **EXPRESSLANES ON I-10**: This project will convert existing HOV lanes on the I-10 from Alameda Street/Union Station to I-605 into ExpressLanes (44 lane miles). The budget will cover the toll technology, toll infrastructure and operational improvements required to complete the conversion. This project will also provide additional ExpressLanes capacity on the El Monte Busway between I-710 and I-605 through re-striping and buffer changes. No general purpose lanes are taken away to create the second ExpressLanes between I-710 and I-605.
2. **EXPRESSLANES ON I-110:** This project will convert existing HOV lanes on the I-110 from 182nd Street/Artesia Transit Center to Adams Boulevard into ExpressLanes (38 lane miles). The budget will cover the toll technology, toll infrastructure and operational improvements required to complete the conversion.

ExpressLanes is a one-year demonstration project. Buses, motorcycles, vanpools, and carpools that currently use HOV lanes will not be charged a toll. General purpose lanes will continue to remain toll-free. The following projects will provide additional access and capacity to the I-10 and I-110 ExpressLanes, to encourage movement of more people rather than more vehicles.

ADAMS BOULEVARD AND DOWNTOWN LOS ANGELES IMPROVEMENTS

3. **I-110 ADAMS/ FIGUEROA FLYOVER STUDY:** The Adams/Figueroa Flyover Study will investigate how the construction of a new structure – connecting the I-110 northbound HVO lane off-ramp directly to Figueroa Street – could improve traffic flow at the end of the I-110 HOV lane.
4. **ADAMS BLVD ST WIDENING:** Adams Boulevard will be widened between the Harbor Freeway off-ramp and Flower Street – adding an additional westbound right-turn-only lane to the HOV bypass connecting to Figueroa Street. Restriping will also add one extra lane to the HOV off-ramp approaching Adams Boulevard to increase capacity.
5. **TRANSIT SIGNAL PRIORITY IN LOS ANGELES:** This project will install bus-signal priority technology on Figueroa Street between Wilshire Boulevard and Adams Boulevard (15 signals), and Flower Street between Wilshire Boulevard and Olympic Boulevard (5 signals) to enhance transit operations. It will also extend the existing AM peak-period northbound bus-only lane on Figueroa Street between 23rd Street and 4th Street to cover the PM peak-period.

INCREASED SILVER LINE AND FEEDER SERVICE

6. **NEW BUSES FOR THE I-10 EL MONTE BUSWAY CORRIDOR:** Before adding ExpressLanes to the corridor, Metro and its transit partner – Foothill Transit – will purchase 30 new buses and increase Silver Line and feeder service on the I-10 El Monte Busway, with a goal of providing service ever three to seven minutes during rush hour.
7. **NEW BUSES FOR THE I-110 HARBOR TRANSITWAY CORRIDOR:** Before adding ExpressLanes to the corridor, Metro and its transit partners – Torrance Transit and Gardena Transit – will purchase 29 new buses to improve Silver Line and feeder service on the I-110 Transitway, with a goal of providing service every three to seven minutes during rush hour.

STATION EXPANSION/IMPROVEMENTS

8. **EL MONTE TRANSIT STATION EXPANSION:** The El Monte Station is the eastern terminus of the El Monte Busway, and is currently the busiest bus terminal west of Chicago. Given that the El Monte Station will now also be the eastern terminus of the ExpressLanes, expansion of the terminal will be required to accommodate additional high-capacity buses, passenger parking, and bike lockers.
9. **PATSAOURAS PLAZA/UNION STATION CONNECTION:** A new Union Station stop will be created for the El Monte Busway, allowing direct access to the station's Patsaouras Transit Plaza. This will eliminate the long walks, operational delays and insufficient lighting and information displays passengers currently have to content with when transferring at Alameda Street to Metro's Red and Gold lines, Metrolink and Amtrak.
10. **IMPROVED ARTESIA TRANSIT CENTER SECURITY:** Improvements at the largest transit center on the I-110 Harbor Transitway include bike lockers to promote non-motorized access and a law enforcement substation to assist with station security.
11. **I-110 HARBOR TRANSITWAY PARK & RIDE AND TRANSIT STATION IMPROVEMENTS:** Improvements to these facilities will include enhanced signage, lighting, and security. Other benefits to customers include new bus stops under Slauson and Manchester stations for Lines 108/115 and improved signage and security for existing Harbor Transitway Park and Ride lots at Slauson, Manchester, Harbor Green Line, Rosecrans, Artesia, Carson, PCH, and Harbor/Beacon in San Pedro.

METROLINK POMONA STATION IMPROVEMENTS

12 **ADDITIONAL COMMUTER RAIL CAPACITY:** This station on Metrolink's San Bernardino Line will undergo several improvements, including the addition of 143 new parking spaces and the expansion of platforms to accommodate longer eight-care trains.

EXPRESS PARK

13 **DOWNTOWN PARKING MANAGEMENT:** This project will use new parking technology to provide motorists alternative payment options and real-time parking availability information for nearly 13,000 on-street and off-street parking spaces in Downtown Los Angeles. The information will aid motorists in understanding their parking options and will guide them to available parking spaces – eliminating the need to search for parking and reducing traffic congestion.

New parking meters will be installed at approximately 5,500 on-street metered parking spaces in the downtown area. These meters will be capable of charging motorists demand-based parking rates – which change depending on the time of day and traffic congestion levels. They will also provide alternative payment options, allowing motorists to pay for parking using their credit card or cell phone and to receive a text message when their paid parking time is about to expire.

VANPOOLS

14 **I-10/I-110 COMMUNITY-BASED VANPOOL FORMATION:** This program will provide vanpool formation services to any community where ExpressLanes are implemented. This includes a dedicated vanpool representative that will actively train community groups to form vanpools and provide support to ensure that vanpools are created and retained.

In addition to receiving the incentive of free access to the new ExpressLanes, vanpoolers along those corridors will also be eligible for vanpool start-up assistance, which may cover the cost of driver and back-up driver training and exams, as well as special training on how best to keep existing vanpools together.

Source: Derived from ExpressLanes project map.

Figure 2-2. LA CRD (ExpressLanes) Program Project Descriptions.

2.1 Los Angeles Congestion Reduction Demonstration (ExpressLanes) Program Elements

The LA CRD (ExpressLanes) Program is focused on reducing traffic congestion based on four complementary strategies known as the 4Ts: Tolling, Technology, Transit, and Travel Demand Management. Below is an overview of the LA CRD projects by strategy:

- **Tolling** – High-occupancy toll (HOT) lanes ("ExpressLanes") are intended to provide mobility options and choices to travelers using I-110 and I-10 by permitting toll-paying vehicles that do not meet the carpool occupancy requirements to use the ExpressLanes by paying a fee. The ExpressLanes were created by expanding existing high-occupancy vehicle (HOV) lanes into HOT lanes along the I-10 (from I-605 to Alameda Street) and along the I-110 (from 182nd Street to Adams Boulevard). In addition, a second HOT lane was created via restriping with no loss of general purpose lanes on I-10 from I-605 to I-710. All vehicles pay to use the ExpressLanes with the exception of publicly or privately operated transit vehicles, motorcycles and multiple-occupant private vehicles (three or more occupants on I-10 during peak hours, two or more all other times; two or more occupants on I-110), and exempt vehicles. All tolls are collected electronically, requiring all vehicles entering the ExpressLanes to be equipped with a FasTrak transponder. Vehicles satisfying the ExpressLanes occupancy requirements, and therefore eligible to use the lane

free of charge, "self-declare" by setting a switch on their transponders. ExpressLanes enforcement is carried out manually through on-site law enforcement observation and automatically through photo-enforcement for vehicles traveling in the ExpressLanes without a transponder. Tolls range from a minimum $0.25 per mile to a maximum $1.40 per mile depending on congestion levels. When travel speeds in the ExpressLanes fall below 45 mph for more than ten minutes, the ExpressLanes have reached capacity. At this point, the HOT lanes revert to HOV only and vehicles that do not meet the carpool occupancy requirements are not permitted to buy their way into the lanes. Qualifying low income commuters receive a $25 credit when they set up their account through the Equity Plan. Cash paying Equity Plan customers receive a $25 waiver for the transponder deposit while credit card paying customers receive an additional $25 for pre-paid tolling. For all Equity Plan customers, the monthly account maintenance fee is waived.[3]

- **Technology** – The LA CRD projects include intelligent parking management (IPM) ("LA ExpressPark") which consists of a variable, demand-based parking pricing system coupled with a parking guidance system that includes real-time parking availability information. IPM is intended to reduce traffic congestion, reduce air pollution, and improve transit efficiency by reducing parking search times to achieve 10 to 30 percent parking availability for on-street parking. The LA ExpressPark system covers approximately 13,500 City of Los Angeles-owned or operated parking spaces (about 6,000 on-street, metered spaces and about 7,500 off-street spaces in an area of downtown LA bounded by the I-10 and I-110 freeways, Alameda Street and Adams Boulevard). LA ExpressPark meter capabilities include demand-based parking rates based on time of day and length of stay; alternate payment options (coins, credit card, smart phone, cell phone); and increased convenience (text messages when paid parking time is about to expire). Vehicle sensors placed in the on-street metered parking spaces provide real-time occupancy and parking duration information to users. Parking conditions and availability in off-street parking locations is determined using vehicle sensors, cordon counting systems, and/or advanced revenue control systems. The parking guidance component of the IPM provides information via a limited number of on-street dynamic message signs when not in use for active traffic management, an Internet web site, mobile phones using the regional 511 interactive voice response system, and smart phones.
- **Transit** – Over half of the overall CRD grant funds were allocated to transit improvements. These improvements included increasing the frequency of Metro bus rapid transit service and municipal feeder service. This was done through the acquisition of 59 new clean fuel expansion buses (30 buses in the I-10 El Monte Busway corridor and 29 buses in the I-110 Harbor Transitway corridor). Various security upgrades made to the Harbor Gateway Transit Center include better lighting, new security cameras, bicycle lockers and a new LA County Sheriff's substation. The El Monte Transit Center was expanded to include reconstruction of the existing transit passenger terminal, additional surface parking, and a new administration facility. There was an expansion of the Pomona (North) Metrolink station which included 143 new parking spaces and extended platforms to accommodate additional rail cars for the San Bernadino Line. The improvements to Harbor Transitway Park-and-Ride lots and Transit Stations included enhanced signage,

[3] The Equity Plan defines low income commuters as Los Angeles residents with an annual household income less than twice the Federal poverty level, e.g., in 2013, a family of 3 with an annual household income of $39,060 or less was eligible.

lighting, and closed-circuit television (CCTV) cameras for existing lots at Slauson, Manchester, Harbor Green Line, Rosecrans, and Harbor Gateway, as well as the relocation of bus stops for Lines 108 and 115 to the Slauson and Manchester Transitway stations. The 37th Street Station was also fitted with translucent and architectural sound attenuation panels to reduce noise levels for waiting customers on the Harbor Transitway. Transit priority system (TPS) technology was implemented on Figueroa Street (15 signals between Wilshire Boulevard and Adams Boulevard) and Flower Street (5 signals between Wilshire Boulevard and Olympic Boulevard) in downtown Los Angeles. To facilitate ExpressLanes traffic movement where the I-110 enters downtown Los Angeles, Adams Boulevard was widened and the Adams Boulevard off-ramp was restriped, both providing an additional lane of capacity. Finally, although it is not part of the transit analysis, it is worth mentioning Metro's Transit Rewards Program. As frequent transit riders on the ExpressLanes, customers can earn toll credits on the ExpressLanes corridors. Using their registered TAP card, transit riders can earn a $5 toll credit by taking 32 one-way trips during peak hours along the I-110 Harbor Transitway or I-10 El Monte Busway. The toll credits can only be used on ExpressLanes and are not valid on other toll roads. The Rewards Program is the first of its kind in the transit and toll industry. As of December 2013, 5,283 FasTrak accounts were enrolled in the Program, and account holders have earned $10,325 in toll credits.

- **Travel Demand Management** – Ridesharing promotion efforts were conducted to increase the number of registered vanpools (with a goal of 100 new registered vanpools on the I-10 and I-110 corridors), and major employer-based ridesharing through the use of promotional methods including subsidies to travelers and vanpool operators and promotional outreach to major employers. In addition, an ExpressLanes Carpool Loyalty Program was developed, which incentivizes vanpool trips by offering monthly drawings for gift cards on each corridor. Vanpools are automatically entered into the drawing every time they use the ExpressLanes and the toll system detects their FasTrak at the 2+ or 3+ setting.

2.2 Context for Deployment of LA CRD (ExpressLanes) Projects

2.2.1 The Los Angeles Congestion Problem

The Los Angeles-Long Beach-Santa Ana urban area has more than 10 million residents. It has the second highest population density in the country, second only to the New York-New Jersey metroplex. Roughly 85 percent of the urbanized area falls within LA County, which covers more than 4,000 square miles and includes 88 cities plus several unincorporated areas.

The region has a complex transportation network of freeways and arterial roads; heavy and light rail; commuter rail; and bus service including bus rapid transit. LA's freeway system, including its network of HOV lanes, is the most extensive in the country. Public transportation is available throughout the region, with Metro being the largest transit provider. Metro buses serve an area of 1,433 square miles. Sixteen other municipal transit operators provide additional bus service in LA County.

The LA region has consistently been ranked as one of the most congested urbanized areas in the country by the Texas A&M Transportation Institute (TTI) Urban Mobility Report. Peak-period traffic and major congestion on the roadway system extends from 6 to 10 a.m. in the morning and from 3 to

7 p.m. in the evening. Roughly 86 percent of peak-period vehicle miles occur in congested conditions. Despite enormous transportation investments, it is widely accepted that major elements of the LA transportation network are operating at or near capacity. The CRD projects are vital to LA because they provide peak hour trip reliability in treatment corridors while providing transit and ridesharing alternatives to vehicle travel. These projects are also testing the public's willingness to accept pricing as a way of moderating congestion and improving transportation facility utilization in the LA region.

2.2.2 LA CRD Deployment Schedule and Interim Evaluation

Table 2-1 below provides an overview of each major CRD project along with its deployment date. All major CRD projects have been deployed, with an overall LA CRD post-deployment period end date of February 23, 2014. As noted earlier, this technical memorandum provides an assessment of baseline data and various post-deployment findings based on available data for the four analysis areas.

Table 2-1. LA CRD Project Deployment Schedule.

LA CRD Project		Deployment Date
ExpressLanes	I-110	November 2012
	I-10	February 2013
ExpressPark	Phase I	June 2013
	Phase II	February 2014
	Phase III	February 2014
Expanded Bus Service	Phase I	June 2011
	Phase II	July 2012
	Phase III	November 2012 (I-110); February 2013 (I-10)
Transit Signal Priority		November 2012
Ridesharing Promotions	Carpool Loyalty Program	November 2012 (I-110); February 2013 (I-10)
Vanpool Formation		October 2012

Secondary CRD projects include: parking expansion, lighting improvement, security upgrade, bus stop cutouts, transit center expansion, sound enclosure, and roadway widening.

Source: Data sourced from Metro

2.2.3 External Factors Impacting the CRD Evaluation

The effectiveness of CRD strategies may be affected by influences external to the projects themselves. The external factors being considered in the LA CRD projects include: unemployment rates, gasoline prices, atypical travel conditions,[4] and non-CRD transportation system changes. This technical memo discusses fluctuations in unemployment rates and gasoline prices. In the final report, the changes in gasoline prices and unemployment rates will be overlaid against travel (i.e., traffic volumes, VMT) to see if both the travel data and the gas prices and unemployment rates follow similar trends. In addition, now that the post-deployment period has ended, the Evaluation Team is collecting data from the local partners for the remaining two exogenous factors. The impact of these exogenous factors on the CRD projects will be assessed in the final report.

The team found that throughout the evaluation period gasoline prices have experienced minor fluctuations with a slight upward trend in cost (as shown in Figure 2-3). In 2011, the average weekly price of gas was $3.90 (with a range of $3.38 to $4.34), in 2012 it was $4.13 (with a range of $3.64 to $4.78), in 2013 it was $3.99 (with a range of $3.63 to $4.39), and in the first two months of 2014 it was $3.76 (with a range of $3.66 to $3.94).[5]

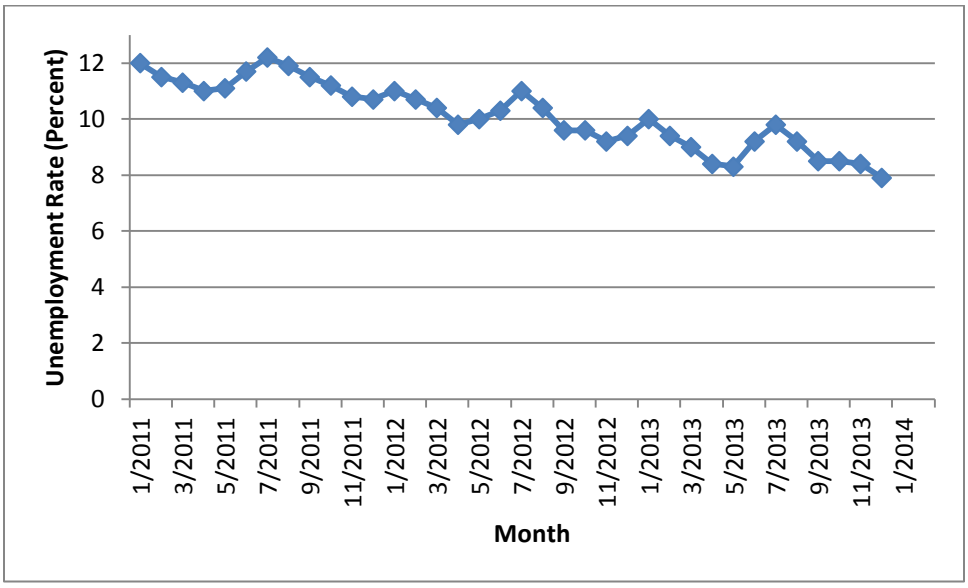
Source: U.S. Energy Information Administration
http://www.eia.gov/oil_gas/petroleum/data_publications/wrgp/mogas_history.html

Figure 2-3. Los Angeles Historic Average Gas Price Chart – October 2010 to February 2014.

[4] The LA area experiences more than 3,000 special events per year including major sports and entertainment events, police actions, film shootings, etc. However, only a fraction of these will affect either of the treatment corridors or downtown LA. Thus, frequently recurring events, such as LA Dodgers baseball games, will not be included as special events.

[5] Weekly average price of a gallon of conventional retail gasoline (an average of all grades and formulations) in Los Angeles (city) as recorded by the U.S. Energy Information Administration. For more information see: http://www.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=PET&s=EMM_EPM0_PTE_Y05LA_DPG&f=W.

Statistics from the U.S. Department of Labor's Bureau of Labor Statistics showed the unemployment rate for the LA Metro area being stable with a slow decreasing trend as shown in Figure 2-4. The unemployment rate averaged 11.4 percent in 2011 (with a range of 10.7% to 12.2%) and 10.1 percent in 2012 (with a range of 9.2% to 11.0%). The unemployment rate was 9.2 percent in November 2012 at the beginning of revenue operations for the I-110 ExpressLanes, and 9.4 percent in February 2013 at the beginning of revenue operations for the I-10 ExpressLanes. The unemployment rate continued to trend lower into the post-deployment period with the 2013 average at 8.9 percent (with a range of 7.9% to 10.0%).[6]



Source: http://data.bls.gov/timeseries/LAUMT06311003?data_tool=XGtable

Figure 2-4. Los Angeles Historic Unemployment Rate – January 2011 through December 2013.

[6] For more information, see: http://data.bls.gov/timeseries/LAUMT06311003?data_tool=XGtable.

Chapter 3. The Los Angeles Congestion Reduction Demonstration (ExpressLanes) Program: Analysis of Preliminary Congestion, Tolling, Transit, and Equity Results

This section presents findings based primarily on the twelve months of post-deployment data following the deployment of the I-110 ExpressLanes (November 2012 – November 2013) and nine months of post-deployment data following the deployment of the I-10 ExpressLanes (late February 2013 to December 2013). Results are presented for four areas of analysis: congestion, tolling, transit, and equity analysis. The findings are intended to give a preliminary indication of how the CRD projects have performed. Final comprehensive results will be presented in the final evaluation report that is currently being developed and will be complete by the end of the year.

3.1 Congestion Analysis

This section examines the impact of the ExpressLanes and other LA CRD improvements on congestion on the I-110 and I-10. The analysis presented below assesses the differences in traffic performance of both the general purpose lanes and the ExpressLanes of I-10 and I-110 after the CRD improvements were fully deployed. Information on changes in travel times, trip speeds, and peak-hour vehicle and passenger throughput is presented.

3.1.1 Travel Times and Speeds

The National Evaluation Team examined travel time and travel speed as the primary measure of effectiveness in the Congestion Analysis. Travel time data were collected by Caltrans using a floating car method. This method involves driving a test vehicle as a "typical vehicle" through the evaluation corridor. Travel speeds and vehicle position were recording using a GPS unit. Morning commute travel times were collected from 5:30 a.m. to 9:00 a.m. and evening commute travel times were collected from 3:00 p.m. to 7:00 p.m. Travel time runs were collected on both the general purpose lanes and the ExpressLanes on the same day.

Table 3-1 lists the day on which travel time data were collected on each facility. Multiple travel time runs were performed on each day. Data from these individual runs were aggregated across the entire peak to provide a total picture of corridor performance in the primary commuting periods. Data were also aggregated by 30-minute intervals within each primary commuting period to examine changes within the peak commute periods. Only travel time data collected on weekdays (Tuesday through Friday) were included in this analysis.

Table 3-1. Days on which Travel Times were Sampled Direction.

Facility	Pre-Deployment	Post Deployment
I-10 EB	2/22/2012; 2/23/2012; 5/15/2012; 6/6/2012	5/14/2013; 5/16/2013; 5/30/2013; 10/1/2013; 10/3/2013; 10/22/2013; 10/24/3013
I-10 WB	2/15/2012; 2/22/2012; 5/15/2012; 6/6/2012	5/16/2013; 5/23/2013; 10/1/2013; 10/3/2013; 10/22/2013; 10/24/3013
I-110 NB	2/8/2012; 2/9/2012; 5/9/2012; 5/10/2012 6/7/2012	2/12/2013; 2/14/2013 5/21/2013; 10/16/2013; 10/17/2013
I-110 SB	2/8/2012; 2/9/2012 5/9/2013; 5/10/2013	2/12/2013; 2/14/2013 5/21/2013; 10/16/2013; 10/17/2013

Source: Caltrans

The following caveats are associated with the use of this data:

- A limited number of travel time runs were available from each evaluation period, and these data represent only a "snap shot" sampling of the conditions that exist in the corridors at the time the data were collected. On any given day, travel conditions in either of the corridors can vary considerably, which may affect the travel times and speeds in the corridor and create variability in the travel time performance.
- It should be recognized that factors external to the evaluation corridor (such as traffic incidents, weather, etc.) may also influence travel conditions in the corridor (e.g., a traffic incident on I-710 may cause a shifting of demand either to or from the analyses corridors). These factors (and the extent to which they would impact operation) may not be known by the data collection crew at the time the dater were collected.
- When the travel time data are aggregated in the 30-minute intervals within the peak, the number of samples in each time interval becomes very small. Statistical comparison of the average travel times by intervals within the peak commuting periods may not be valid because of the limited sample sizes.
- The post deployment data includes travel times runs collected from four days in October 2013. Travel times in October 2012 were not sampled in the pre-deployment evaluation period; therefore, seasonality differences may exist in the travel time data.
- Several of the days where data were collected in the pre-deployment interval on I-10 were located near a regional school holiday which may have impacted traffic patterns on this facility.

Additional data beyond the time period of the National Evaluation were also collected to provide insight into continuing operations in both corridors. These data include the following:

- On I-10, travel time data from February and March 2014 were also analyzed to provide insight into how the corridor was operating post-construction.
- On I-110, travel time data from February and March 2014 were also analyzed to provide insight into current operating condition in the corridor post CRD deployment

I-10 Travel Times and Speeds

Table 3-2 and Table 3-3 present summary statistics for the peak direction of travel (westbound in the morning and eastbound in the evening) on both the I-10 general purpose lanes and ExpressLanes in the two evaluation periods: Pre-CRD Deployment; and Post- CRD Deployment. It is important to note these statistics are aggregated over the entire peak period (5:00 a.m. to 9:00 a.m. for the morning peak period and from 3:00 p.m. to 7:00 p.m. in the evening peak).

The data indicates that when aggregated over the entire morning commute, travel times in both the general purpose lanes and the ExpressLanes showed an initial reduction after implementing the CRD improvements. Table 3-2 shows that travel times in the general purpose lanes decreased from approximately 31 minutes to 29 minutes in the initial post-deployment evaluation period. Similarly, travel times in the ExpressLanes reduced approximately 2 minutes – from approximately 16 minutes to 14 minutes – during the initial post deployment evaluation period.

For the evening commute, average travel times in the general purpose lanes increased by approximately 4 minutes during the post-deployment evaluation period. For the ExpressLanes, evening commute period travel times declined by approximately 1.5 minutes below the pre-deployment levels in the year following the deployment of the CRD improvements

Table 3-2. Morning Commute Period Travel Times (5:00 a.m. through 9:00 a.m.) - I 10 General Purpose Lanes and ExpressLanes, Westbound.

	General Purpose Lanes		ExpressLanes	
Descriptive Statistics	Pre-Deployment	Post-Deployment	Pre-Deployment	Post-Deployment
Average	30.88	28.99	15.96	13.77
Standard Deviation	10.91	9.14	2.93	1.12
Median	31.99	29.53	15.29	13.65
Minimum	13.32	13.58	11.58	12.18
Maximum	49.1	53.45	12.60	17.18
Number of Observations	40	56	48	68

Source: Texas A&M Transportation Institute based on data provided by Caltrans

Table 3-3. Evening Commute Period Travel Times (3:00 p.m. through 7:00 p.m.) - I 10 General Purpose Lanes and HOV/ExpressLanes, Eastbound

	General Purpose Lanes		ExpressLanes	
Descriptive Statistics	Pre-Deployment	Post-Deployment	Pre-Deployment	Post-Deployment
Average	30.30	34.61	18.14	16.44
Standard Deviation	5.46	10.96	2.13	2.48
Median	29.93	32.70	18.06	16.05
Minimum	18.13	17.32	14.55	12.80
Maximum	39.65	58.73	25.20	28.73
Number of Observations	46	74	48	82

Source: Texas A&M Transportation Institute based on data provided by Caltrans

Figure 3-1 shows that between 5:30 a.m. and 7:30 a.m. total travel times in the general purpose lanes increased slightly in the post-deployment period. These increases ranged from approximately 0.5 minutes (between 7:00 and 7:30) to 4 minutes (from 6:00 a.m. to 7:00 a.m.) After 7:30 a.m., travel times in the I-10 general purpose lanes declined between the post-deployment period compared to the pre-deployment conditions. During this period, travel time in the general purpose lanes were 5 to 8 minutes shorter after the CRD improvement were fully implemented compared to pre-deployment conditions.

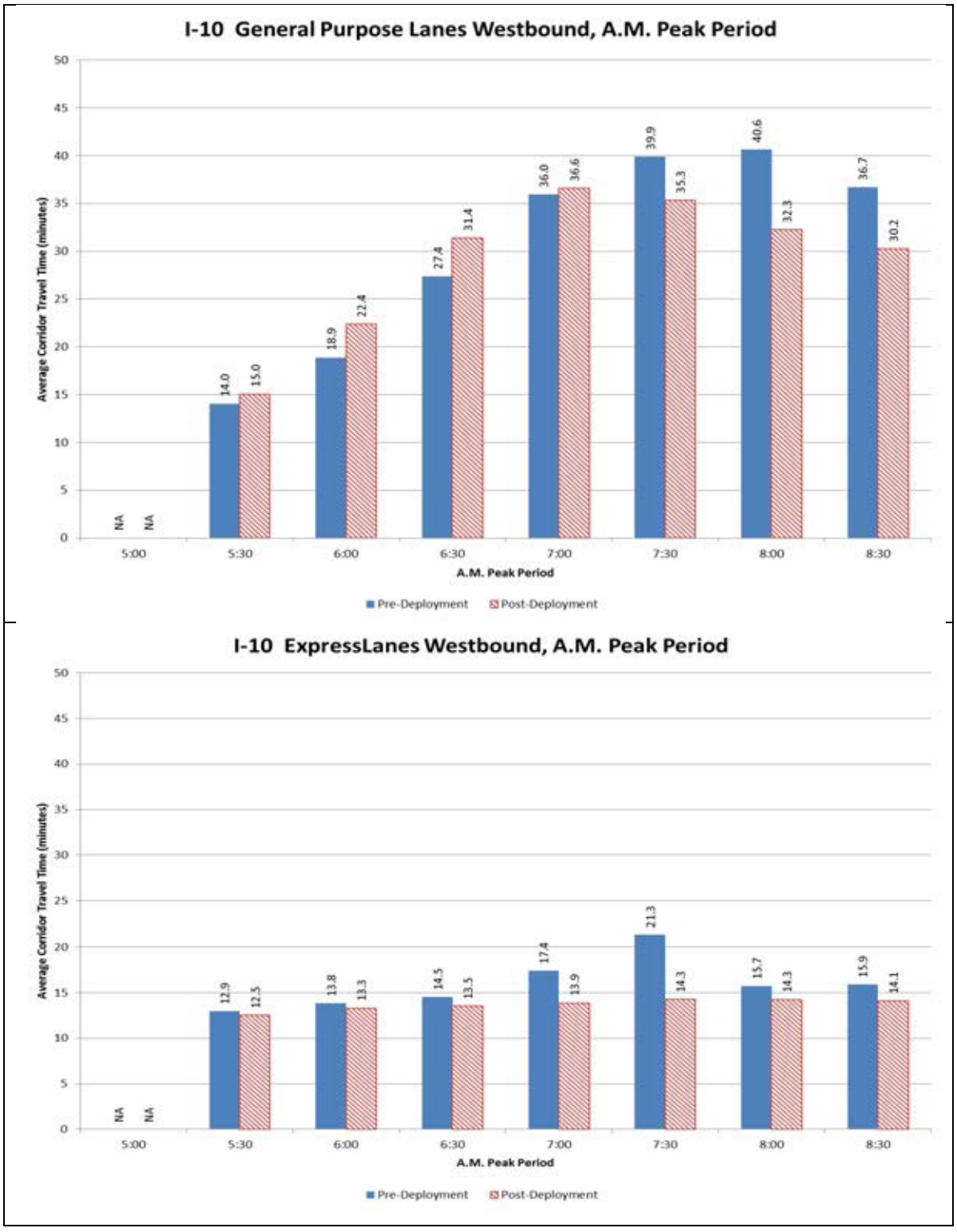
Figure 3-1 also shows that travel times in the 1-10 ExpressLanes improved in the post-deployment period during the morning commute period. Figure 3-1 shows that travel time in the ExpressLanes improved in the post-deployment period across all time intervals in the morning commute. During the peak of the morning commute (7:00 a.m. to 8:00 a.m.) travel times in the I-10 ExpressLanes improved between 4 and 7 minutes after the CRD improvements were fully deployed.

Figure 3-2 compares travel times in the eastbound general purpose lanes and ExpressLanes during the evening commute on I-10 pre- and post-deployment of the CRD improvements. Figure 3-2 shows that travel times in the general purpose lanes increased in every interval across the evening compute while travel times in the ExpressLanes improved or essentially remained the same in the post-deployment period compared to pre-deployment levels. The figure shows that travel times eastbound in the general purpose lanes on I-10 during the evening commute increased by as much as 10 minutes (from 4:30 p.m. to 5:00 p.m.) in the post-deployment period compared to the pre-deployment conditions. Travel times in the general purpose lanes increased by over 3 minutes in five other intervals during the evening commute.

In contrast, travel times on the I-10 ExpressLanes remained relatively consistent across all intervals in the evening commute. The maximum increase in travels times in the ExpressLanes between the pre- and post-deployment periods was less than a minute, while the maximum decrease in travel times was approximately 3 minutes. Between 3:00 p.m. and 5:00 p.m., travel times in the ExpressLanes were consistently 2-minutes faster in the post-deployment period.

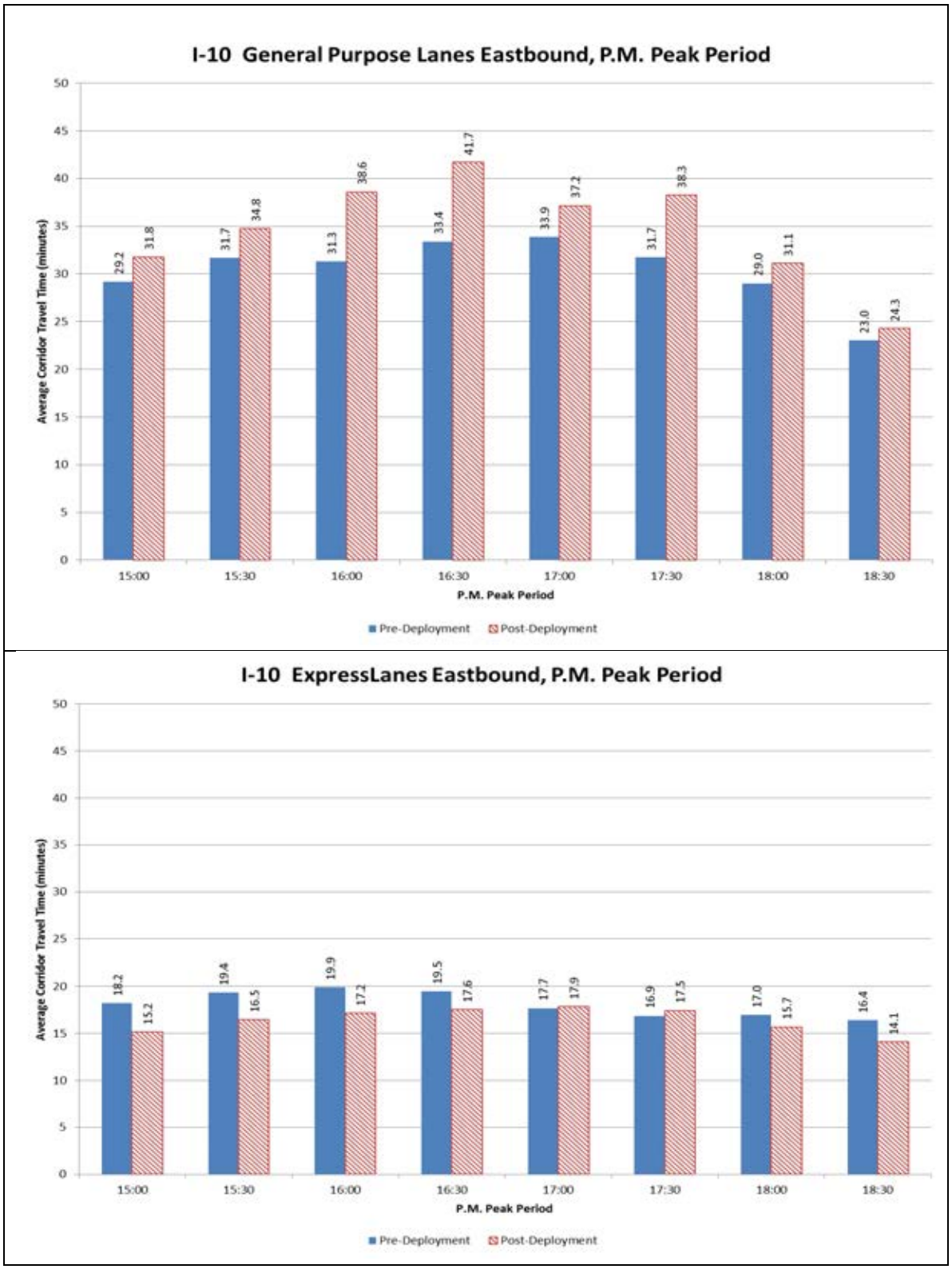
Figure 3-3 shows the average travel speeds in both the general purpose lanes and ExpressLanes in the westbound direction on I-10 during the morning commute while Figure 3-4 shows the average main lane and ExpressLanes travel speeds in the eastbound direction in the evening commute. These figures show the following:

- Between 7:30 a.m. and 9:00 a.m., average trip speeds in the I-10 general purpose lanes in the westbound direction improved between 2 and 5 mph following the deployment of the CRD improvements.
- Average trip speeds in the I-10 ExpressLanes during the morning commute were consistently above 55 mph throughout the entire morning commute period in the post-deployment evaluation period. Prior to the CRD improvements, average trip speeds in the westbound ExpressLanes experienced large fluctuations, ranging from 64 mph to 39.8 mph. Average trip speeds fell below the 45 mph threshold between 7:30 a.m. to 8:30 a.m. in the pre-deployment condition. After the CRD improvement, average trip speeds never dropped below 45 mph in the ExpressLanes, and ranged between 58 mph and 65 mph.



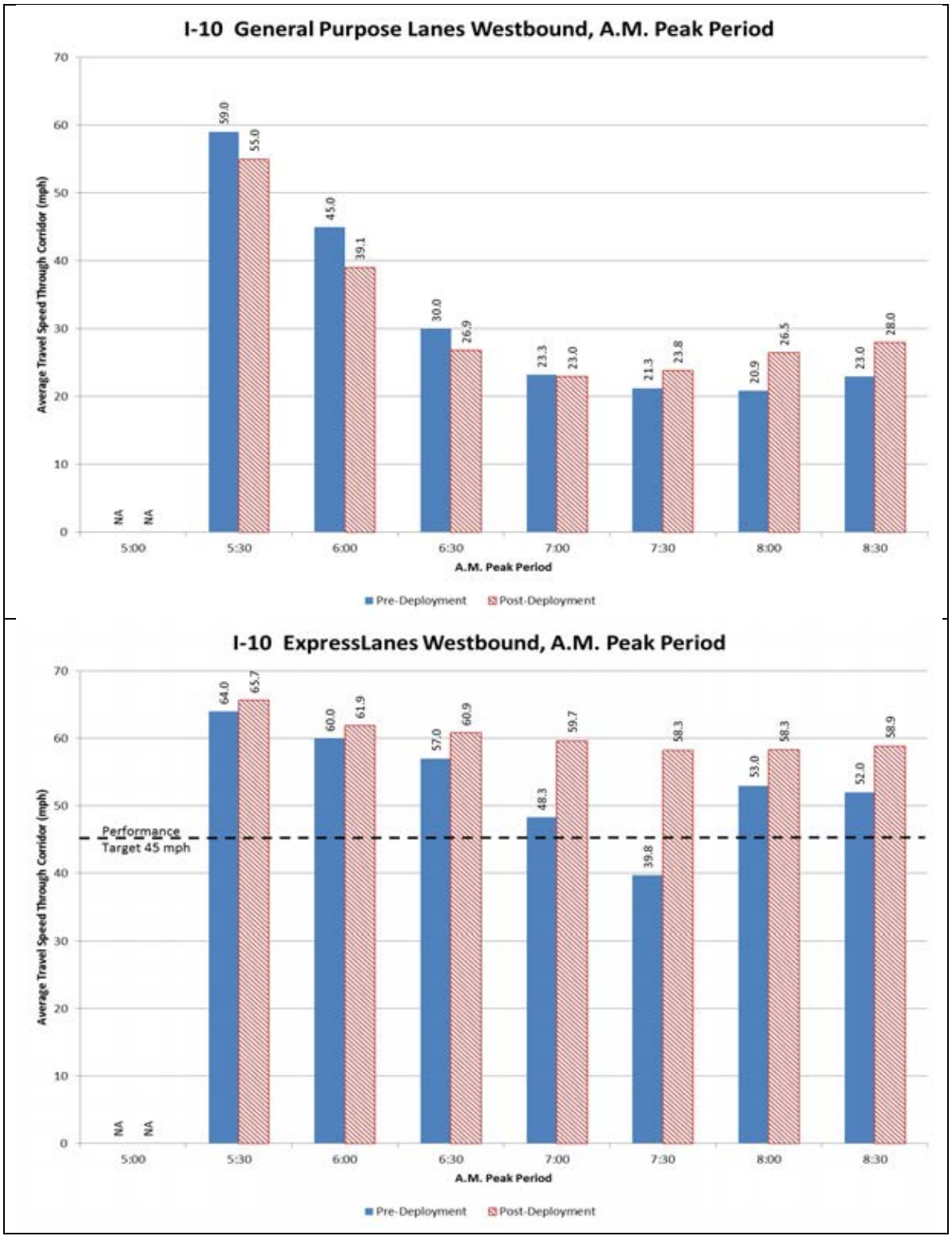
Source: Texas A&M Transportation Institute from data provided by Caltrans

Figure 3-1. Average General Purpose Lanes and ExpressLanes Corridor Travel Speed on I-10 Westbound during the Morning Commute (5:00 a.m. to 9:00 a.m.).



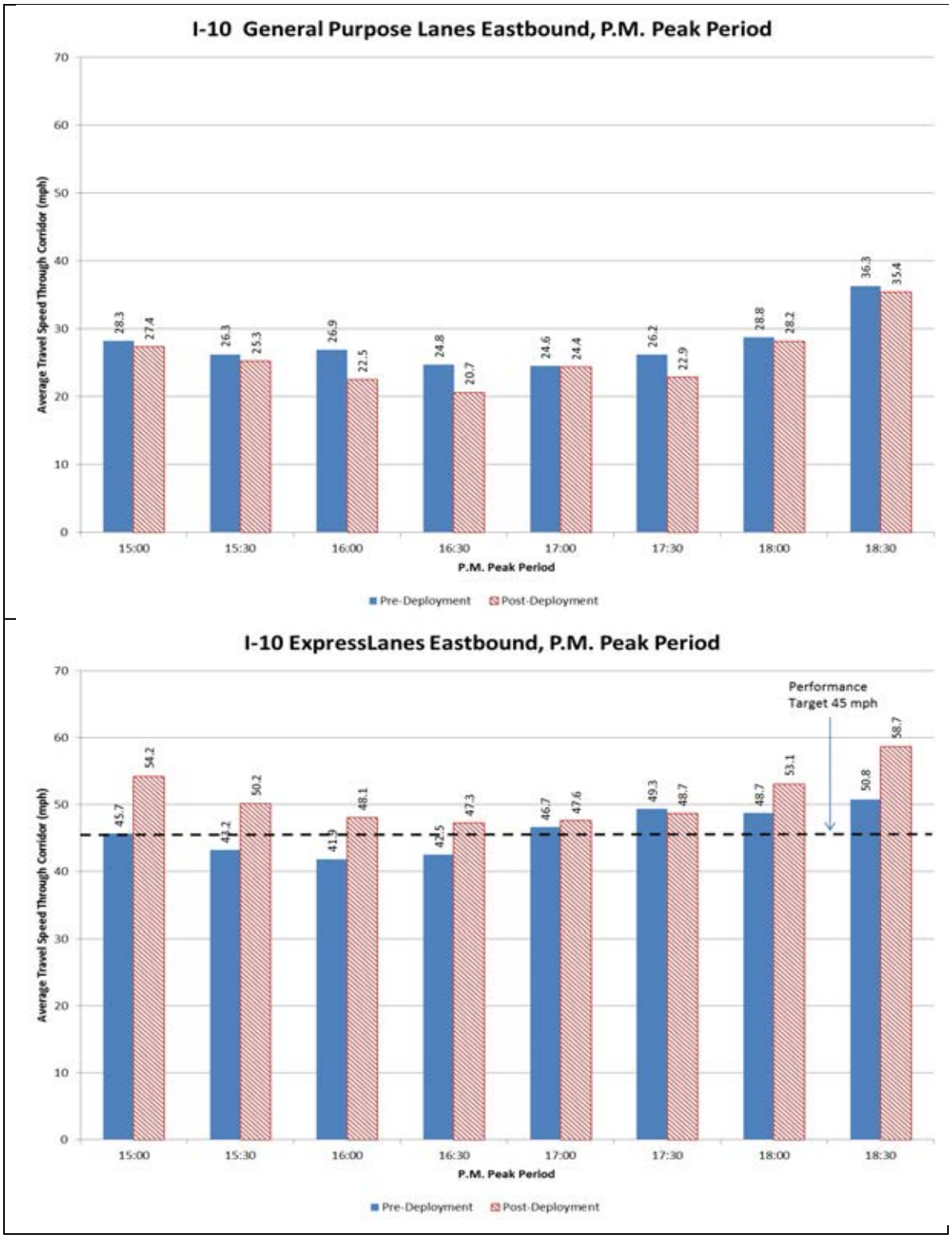
Source: Texas A&M Transportation Institute from data provided by Caltrans

Figure 3-2. Average Travel Times on I-10 Eastbound by 30-minute Intervals during the Evening Commute (3:00 a.m. to 7:00 p.m.).



Source: Texas A&M Transportation Institute from data provided by Caltrans

Figure 3-3. Average Corridor Travel Speeds in the General Purpose Lanes and ExpressLanes on I-10 Westbound during the Morning Commute.



Source: Texas A&M Transportation Institute from data provided by Caltrans

Figure 3-4. Average General Purpose Lanes and ExpressLanes Corridor Travel Speed on I-10 Eastbound during the Evening Commute (3:00 p.m. to 7:00 p.m.).

- No change occurred in average trip speeds in the general purpose lanes in the evening commute between the pre- and post-deployment evaluations. Average trip speeds were slower by approximately 2 mph in the post-deployment period compared to pre-deployment levels, but in both periods, average trip speeds were below 30 mph, in all but the last interval (from 6:30 p.m. to 7:00 p.m.) in both the pre- and post-deployment condition.
- In the evening commute, average trip speeds for eastbound users of the ExpressLanes improved after the deployment of the CRD improvements. In the pre-deployment period, the trip speed of users of the ExpressLanes averaged less than 45 mph between 3:00 p.m. and 5:00 p.m. In the post-deployment period, average travel speed remained above remained above 45 mph in all intervals across the evening commute.

I-110 Travel Times and Speeds

Table 3-4 shows the average travel times for both the general purpose lanes and the ExpressLanes in the peak direction of travel (northbound) for the morning commute (5:00 a.m. to 9:00 a.m.) on I-110. Table 3-5 shows the average peak period travel times in the southbound direction for the evening commute period (3:00 p.m. to 7:00 p.m.).

Table 3-4. Average Peak Period Travel Times for the Morning Commute (5:00 a.m. through 9:00 a.m.) for I-110 General Purpose Lanes and ExpressLanes, Northbound.

	General Purpose Lanes		ExpressLanes	
Descriptive Statistics	**Pre-Deployment**	**Post Deployment**	**Pre-Deployment**	**Post Deployment**
Average	27.09	27.07	12.40	14.29
Standard Deviation	9.88	8.48	2.61	5.43
Median	29.27	27.52	11.48	11.70
Minimum	10.68	10.90	9.52	9.88
Maximum	42.98	42.97	20.52	32.55
Number of Observations	50	49	61	53

Source: Texas A&M Transportation Institute from data provided by Caltrans

Table 3-5. Average Peak Period Travel Times for the Evening Commute (3:00 p.m. through 7:00 p.m.) for I-110 General Purpose Lanes and ExpressLanes, Southbound.

	General Purpose Lanes		ExpressLanes	
Descriptive Statistics	**Pre-Deployment**	**Post-Deployment**	**Pre-Deployment**	**Post-Deployment**
Average	18.45	20.16	10.75	10.64
Standard Deviation	2.39	2.81	0.67	0.91
Median	20.88	19.05	10.56	10.27
Minimum	11.58	14.60	9.92	9.82
Maximum	23.43	27.10	13.02	13.92
Number of Observations	47	59	62	61

Source: Texas A&M Transportation Institute from data provided by Caltrans

Table 3-4 shows that travel times on the I-110 general purpose lanes in the morning commute remained approximately the same between the pre-and post-deployment evaluation periods. In the pre-deployment period, travel times on the I-110 general purposes lanes averaged approximately 27.09 minutes. In the post-deployment period, travel times in the I-110 general purpose lanes averaged 27.07 minutes when aggregated over the entire a.m. commute period.

Figure 3-5 also shows the average travel time measured for the I-110 ExpressLanes during the morning commute for both the pre- and post-deployment period. The table shows that average northbound travel times in the ExpressLanes increased by 2 minutes in the post-deployment period compared to pre-deployment levels. When averaged over the entire morning commute interval, average travel times in the ExpressLanes increased from approximately 12 minutes to approximately 14 minutes in post-deployment period.

Table 3-5 show the average travel times computed for the general purpose lanes and the ExpressLanes in the southbound direction of I-110 for both the pre- and post-deployment periods. The table shows that during the evening commute, average travel times in the general purpose lanes of I-110 increased from 18.5 minutes in the pre-deployment period to slightly over 20 minutes in the post-deployment evaluation interval – a change of 1.5 minutes. The table also shows that average evening commute travel times in the ExpressLanes, remained approximately the same in the post-deployment period compared to pre-deployment conditions.

Figure 3-5 compares pre- and post-deployment travel times on I-110 general purpose lanes and ExpressLanes by 30-minute intervals for the morning commute. Figure 3-6 provides the same comparison of pre- and post-deployment travel times for the evening commute. The following observations can be made from these figures:

- Before 6:30 a.m., general purpose lanes travel times were less than 1.5 minute longer in the post-deployment period
- Between 6:30 a.m. and 8:00 a.m., average travel times in the general purpose lanes were generally 2 to 3 minutes faster in the post-deployment period compared to the pre-deployment period.
- For the ExpressLanes, average travel times remained close to pre-deployment levels until 7:30 a.m. Beginning at 7:30 a.m., average ExpressLanes travel times increased between 3 and 5 minutes for the remainder of the morning commute.
- For both the general purpose lanes and the ExpressLanes, average travel times during the evening commute remained relatively consistent between the pre-and post-evaluation periods. Average travel times in the general purpose lanes increased by less than 2 minutes across all intervals during the evening commute.

Figure 3-7 compares the average trip speeds for the general purpose lanes and the ExpressLanes during the morning commute on I-110. Figure 3-7 shows that the general purpose lanes experience a sharp decline in average trip speeds from 5:30 a.m. to 6:30 a.m. in both the pre-and post-deployment periods, where average trip speed leveled out at around 20-25 mph. This relationship is typical of a facility experiencing severe congestion. Figure 3-7 shows that the general purpose lanes exhibit this pattern in both the pre-and post-deployment conditions.

Average trip speeds in the ExpressLanes during the morning commute remained the same or slightly higher in the post-deployment period for most of the morning commute; however, beginning with the 7:30 time interval average travel speeds in the post-deployment period were 8 to 10 mph slower in the post-deployment condition compared the pre-deployment condition. Figure 3-7 also shows that

average trips speeds prior to the full implementation of the CRD improvement remained above the 45 mph threshold in all but one time interval (7:30 a.m. to 8:00 a.m.). In the post-deployment conditions, average trips speeds average were near or below 45 mph from 7:30 a.m. to 9:00 a.m.

Figure 3-8 compares the average trips speeds in the both the general purpose lanes and ExpressLanes in the southbound direction during the evening commute. The figure shows that average trip speeds in the general purpose lanes of I-110 remained relatively constant across all intervals, averaging around 37 mph in the pre-deployment level and 34 mph in the post-deployment period. The figure shows that average trip speeds in the general purpose lanes were 2 to 3 mph slower in the post-deployment period compared to pre-deployment condition. Average travel speeds in the southbound ExpressLanes showed little change between the pre- and post-deployment conditions. For the ExpressLanes, trip speeds averaged around 62 mph in both the pre- and post-deployment periods. Figure 3-8 show very little variation in average trip speeds across the evening commute in either the pre- or post-deployment evaluation periods

3.1.2 Throughput

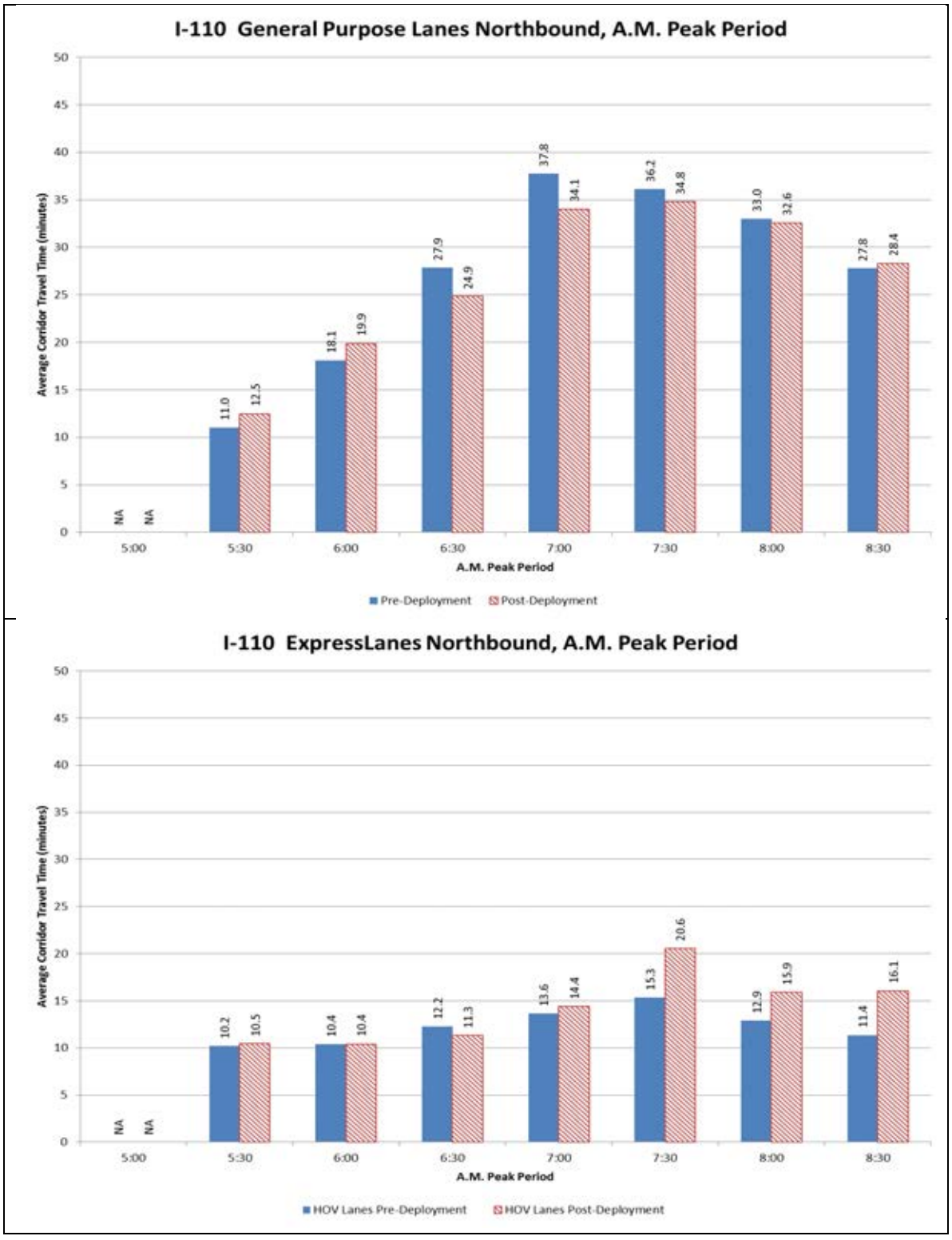
The National Evaluation Team also examined both vehicle and passenger throughput. This analysis was based on vehicle occupancy counts conducted by Caltrans. Vehicle occupancy data on both the I-10 and I-110 were collected using observers. Data collection personnel were positioned along the roadway (either overhead or adjacent to the roadway) so as to observe the number of occupants in each vehicle. Each vehicle was then categorized based on the number of occupants in each vehicle (single occupant vehicles, double-occupant vehicles, triple-occupant vehicles, etc.). Observed vehicles were placed into one of six different categories based on the number of occupancy identified in the vehicle. Vanpools were designated as a 6+ occupant vehicle, while motorcycles were classified single-occupant vehicles. Buses were also categorized based on the estimated loading of the bus (full; ½-full, or ¼-full). Person throughput was calculated by multiplying the number of vehicles counted in each category by the occupancy requirement for each level in each category. The analysis focused only on peak hour vehicle and passenger throughput.

Figure 3-9 shows the locations where Caltrans conducted their vehicle occupant studies. Table 3-6 shows the dates of the Caltrans vehicle occupancy counts used in this analysis.

3.1.2.1 Vehicle Throughput

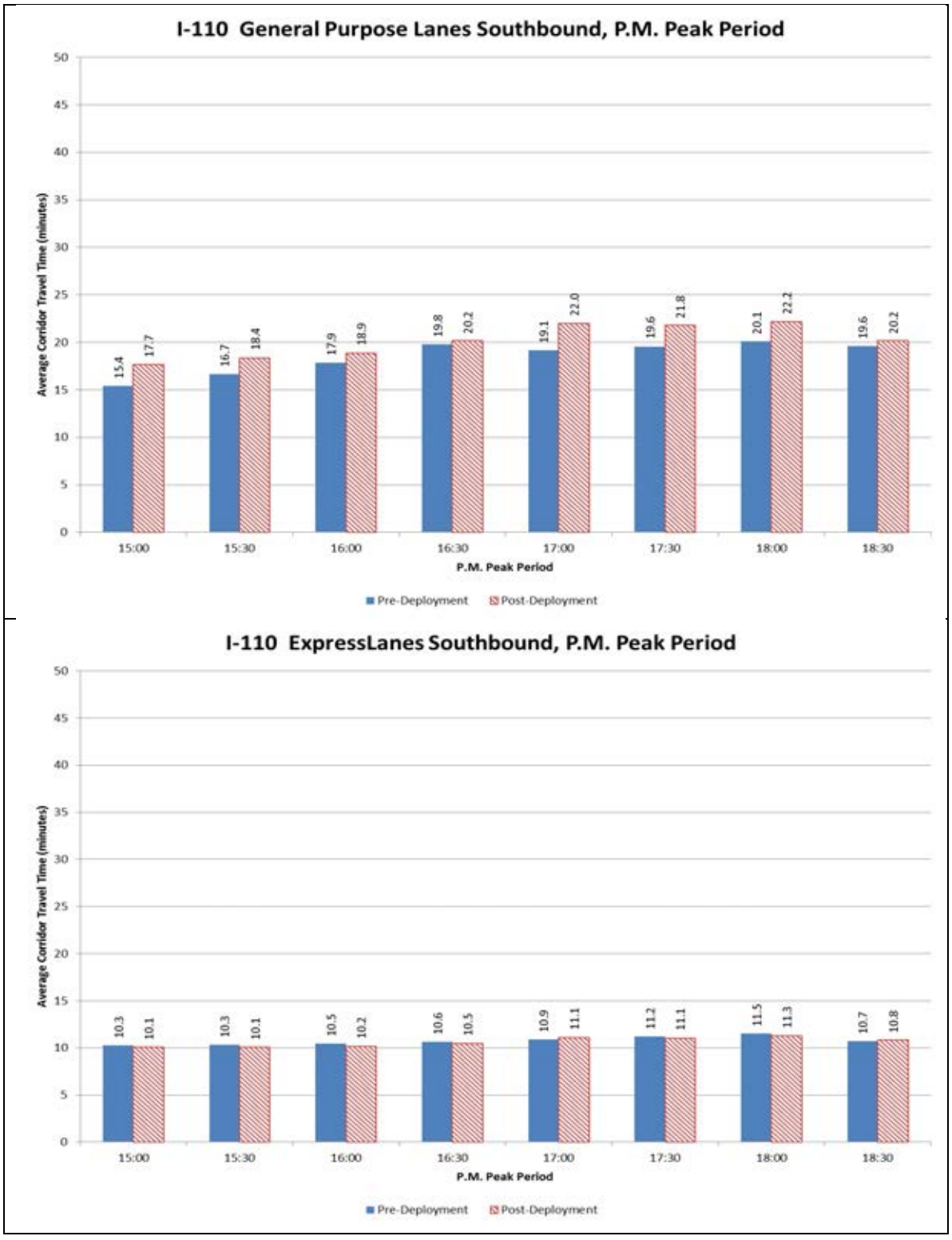
The National Evaluation Team also used vehicle throughput as one the primary measures of effectiveness in the congestion analysis. Vehicle throughput is the number of vehicles that traverse a distance over a short period of time. Vehicle throughput diminishes as congestion forms. Data show that maximum vehicle throughput occurs when the freeways is operating with travel speeds ranging between 45 mph and 65 mph. For this study, vehicle throughput was computed using the vehicle occupant counts provided by Caltrans. Caltrans provided peak hour vehicle throughput counts for both the general purpose lanes and the ExpressLanes.

Table 3-7 shows the change the peak-hour vehicle throughput on I-110 from the counts performed before and after the CRD improvements were implemented. The table shows that total peak hour vehicle throughput on I-110 increased at Adams Boulevard while remaining relatively constant at Slauson Avenue during the morning commutes. At both sites, the number of vehicles using the ExpressLanes during the peak hour increased with the deployment of the CRD improvement. At Adams, vehicle throughput in the ExpressLanes increased by over 17 percent. At Slauson, vehicle throughput in the ExpressLanes increased by 35 percent. In the evening peak hour, while the total vehicle throughput increased in the southbound direction, the vehicle throughput of the ExpressLanes remained near pre-deployment levels.



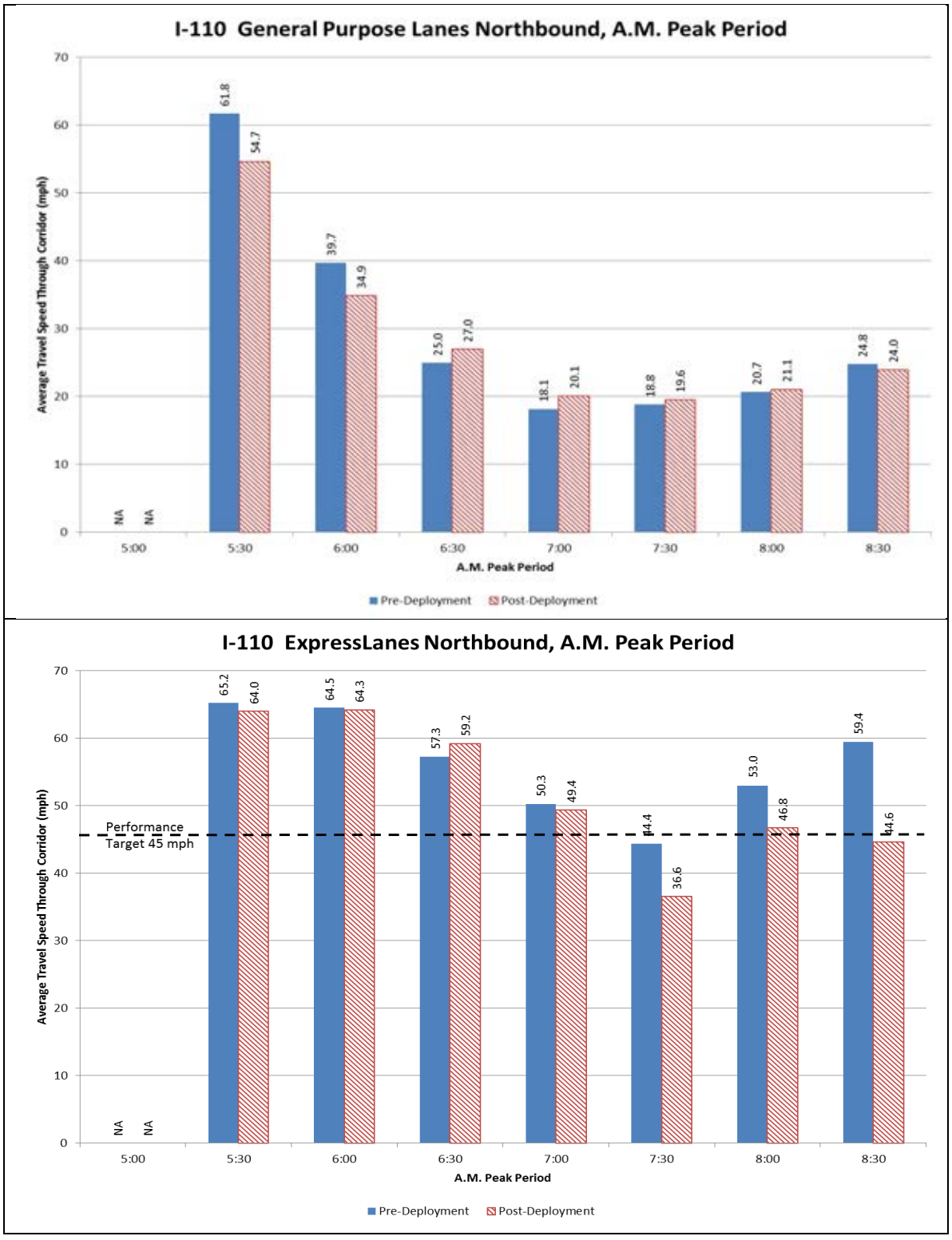
Source: Texas A&M Transportation Institute from data provided by Caltrans

Figure 3-5. Average Travel Times on I-110 Northbound by 30-minute Intervals during the Morning Commute (5:00 a.m. to 9:00 a.m.).



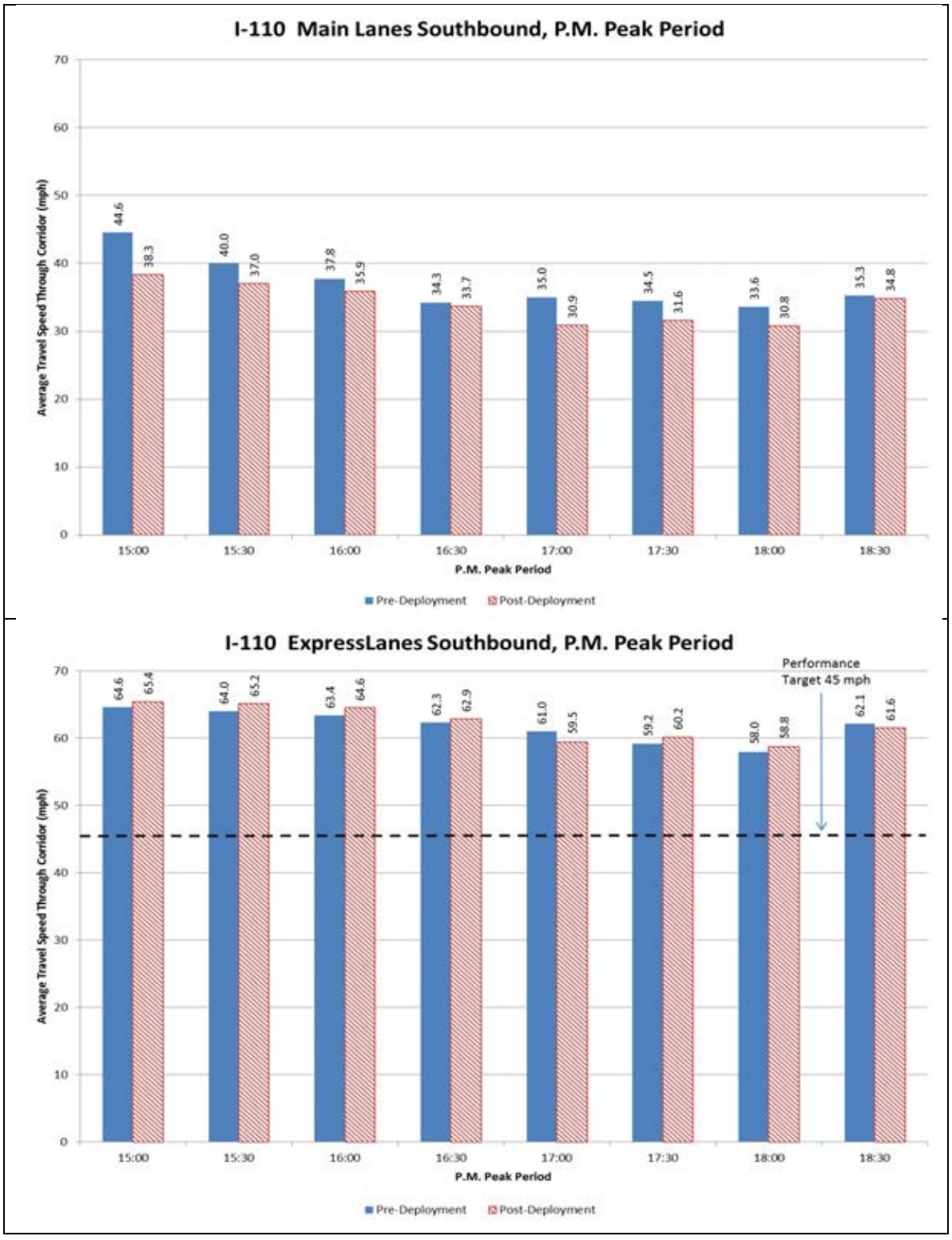
Source: Texas A&M Transportation Institute from data provided by Caltrans

Figure 3-6. Average Travel Times on I-110 Southbound by 30-minute Intervals during the Evening Commute (3:00 a.m. to 7:00 p.m.).



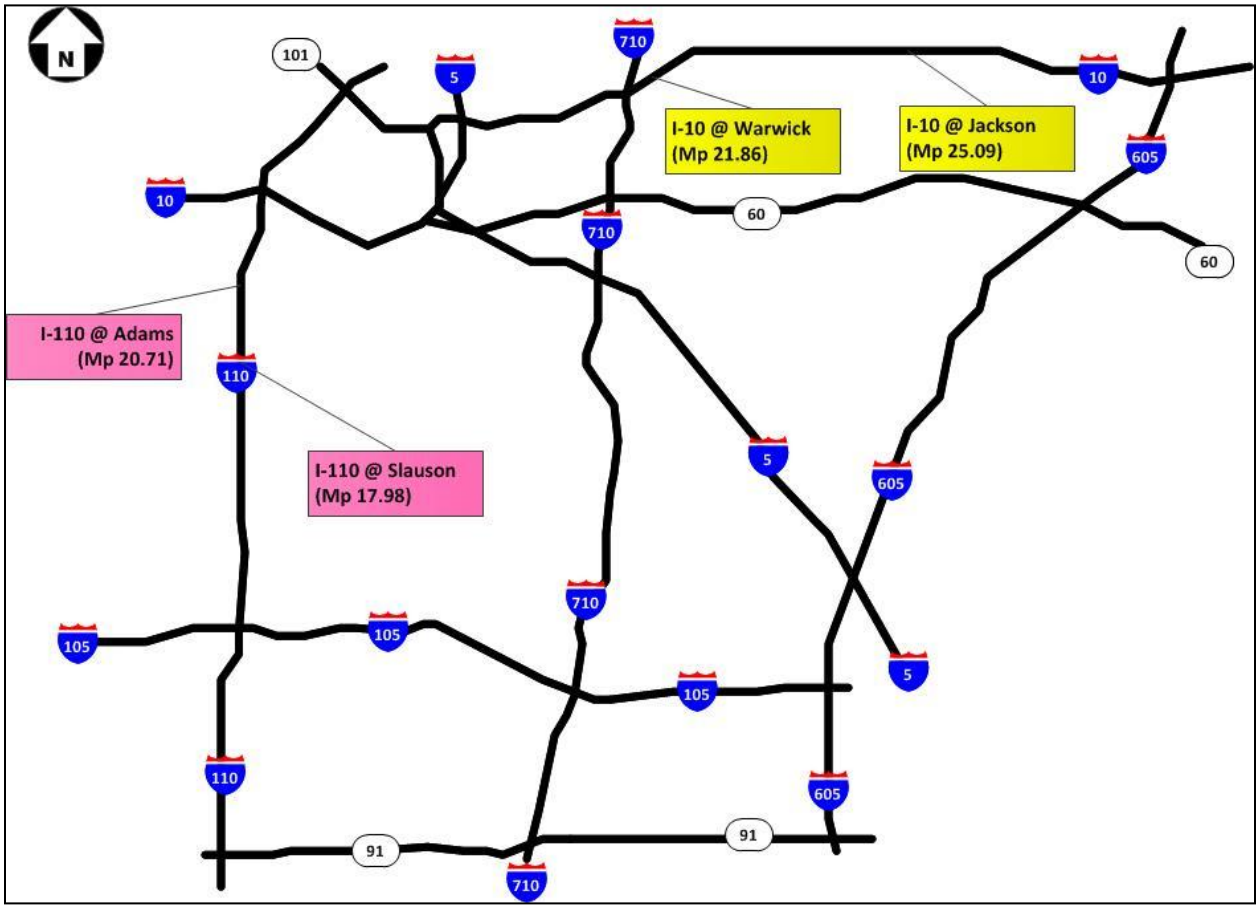
Source: Texas A&M Transportation Institute from data provided by Caltrans

Figure 3-7. Average General Purpose Lanes and ExpressLanes Corridor Travel Speed on I-110 Northbound during the Morning Commute (5:00 a.m. to 9:00 a.m.).



Source: Texas A&M Transportation Institute from data provided by Caltrans

Figure 3-8. Average General Purpose Lanes and ExpressLanes Corridor Travel Speed on I-110 Southbound during the Evening Commute (3:00 p.m. to 7:00 p.m.).



Source: Texas A&M Transportation Institute

Figure 3-9. Approximate location Of Caltrans Vehicle Occupancy Count Studies

Table 3-6. Dates of Caltrans Vehicle Occupant Counts Used in UPA Throughput Analysis.

Facility		Pre-Deployment	Post Deployment
I-10 W	Warwick (Mp 21.86)	5/22/2012	6/4/2013
	Jackson (Mp 25.09)	5/17/2012	5/02/2013 9/26/2013
I-110	Adams (20.71)	5/23/2012	2/27/2013 6/05/2013
	Slauson (17.98)	5/16/2012 6/28/2012	2/26/2013 5/1/2013 10/18/2013

Source: Caltrans

Table 3-7. Change in Peak Hour Vehicle Throughput on I-110 as a result of the LA CRD Improvements.

	Peak Hour Vehicle Throughput			
Lane Type	**Pre-Deployment**	**Post-Deployment**	**Change (# of Vehicles)**	**Percent Change**
I-110 NB @ Adams (20.71) -- AM Peak Hour				
General Purpose Lanes	7554	8073	519	6.9%
ExpressLanes	968	1136	168	17.4%
Total	**8522**	**9209**	**687**	**8.1%**
I-110 NB @ Slauson (17.98) -- AM Peak Hour				
General Purpose Lanes	5818	4920	-898	-15.4%
ExpressLanes	2365	3195	830	35.1%
Total	**8182**	**8115**	**-67**	**-0.8%**
I-110 SB @ Slauson (17.98) -- PM Peak Hour				
General Purpose Lanes	6090	6705	615	10.1%
ExpressLanes	2549	2557	8	0.3%
Total	**8639**	**9262**	**623**	**7.2%**

Source: Texas A&M Transportation Institute based on data provided by Caltrans

Table 3-8 shows the change in peak-hour vehicle throughput for both the a.m. and p.m. peaks for I-10. The table shows vehicle throughput in the ExpressLanes increased in both the a.m. and p.m. peaks, while vehicle throughput in the general purpose lanes reduced slightly. Most of the growth in the use of the ExpressLanes on I-10 was attributed to increase in capacity associated with adding another lane to the ExpressLanes.

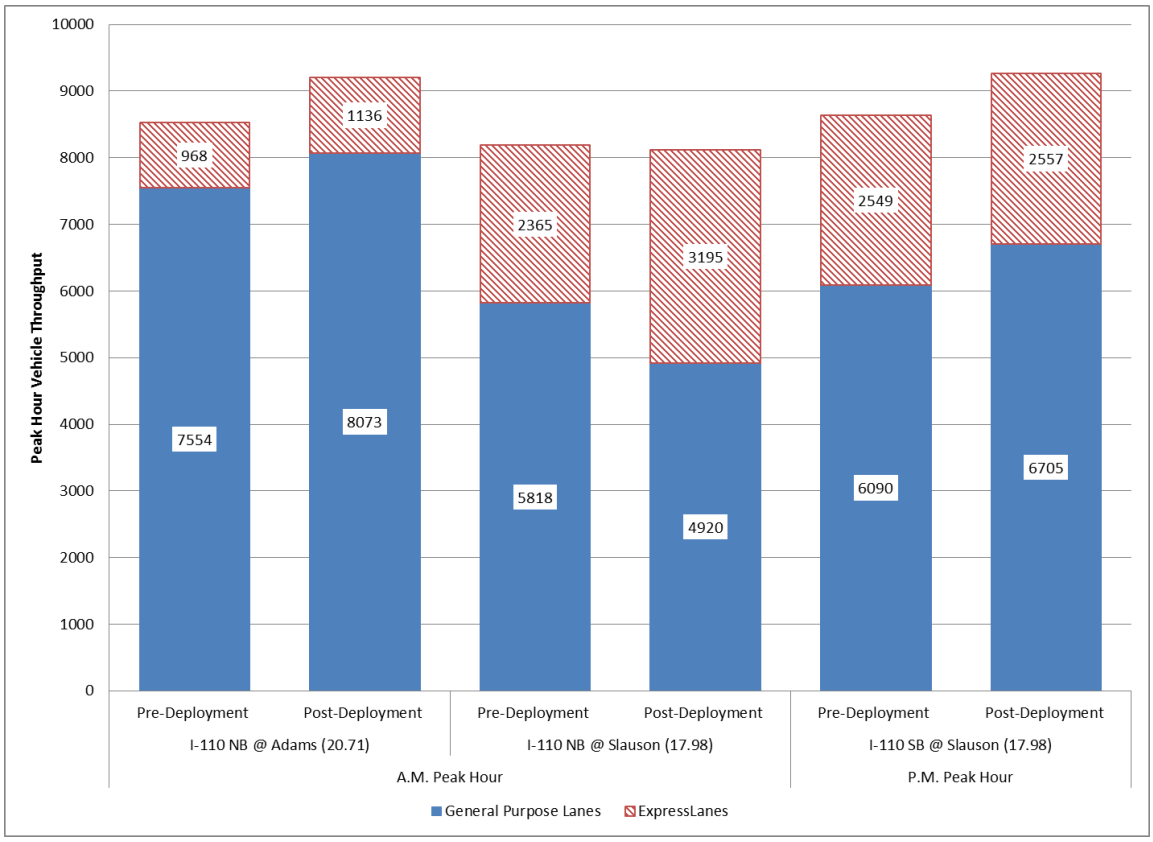
Figure 3-10 shows the relative contribution of both the general purpose lanes and the ExpressLanes to the total peak hour vehicle throughput in I-110. The figure show that for the northbound direction in the morning peak hour, the proportion of total peak-hour throughput using the ExpressLanes remained approximately the same between the pre- and post-deployment periods. At Slauson, however, the percentage of the peak-hour traffic using the I-110 ExpressLanes during the morning peak-hour increased from 28.9 percent in the pre-deployment period to 39.4 percent in the post-deployment period – a change of approximately 11 percent. In the southbound direction in the p.m. peak, the percentage of the total peak-hour vehicle throughput being generated by the ExpressLanes remained at approximately 28 percent in the post deployment period while the total peak-hour vehicle throughput at Slauson increased slightly.

Figure 3-11 shows a similar comparison of the relative contribution of the ExpressLanes to the total peak-hour vehicle throughput for I-10. The figure shows that at both locations, the overall contribution of the ExpressLanes to the peak-hour vehicle throughput increased in the post deployment period.

Table 3-8 Change in Peak Hour Vehicle Throughput on I-10 as a result of the LA CRD Improvements.

Lane Type		Peak Hour Vehicle Throughput			
		Pre-Deployment	Post-Deployment	Change (# of Vehicles)	Percent Change
I-10 WB @ Warwick (21.86)-- AM Peak					
General Purpose Lanes		7720	5675	-2045	-26.5%
ExpressLanes		878	1777	899	102.4%
Total		**8598**	**7452**	**-1146**	**-13.3%**
I-10EB @ Warwick (21.86)-- PM Peak					
General Purpose Lanes		6160	5710	-450	-7.31%
ExpressLanes	2+ Occ.	524	675	151	28.82%
	3+ Occ.	599	884	285	47.58%
Total *		**6759**	**6594**	**-165**	**-2.4%**
I-10 WB @ Jackson (25.09)-- AM Peak					
General Purpose Lanes		4350	4830	480	11.0%
ExpressLanes		1467	2295	828	56.4%
Total		**5817**	**7125**	**1308**	**22.5%**
I-10 EB @ Jackson (25.09)-- PM Peak					
General Purpose Lanes		6780	5940	-840	-12.4%
ExpressLanes	2+ Occ.	1020	1243	1465	70.7%
	3+ Occ.	972	1618	646	66.4%
Total *		**7752**	**7558**	**-194**	**-2.5%**

Source: Texas A&M Transportation Institute based on data provided by Caltrans



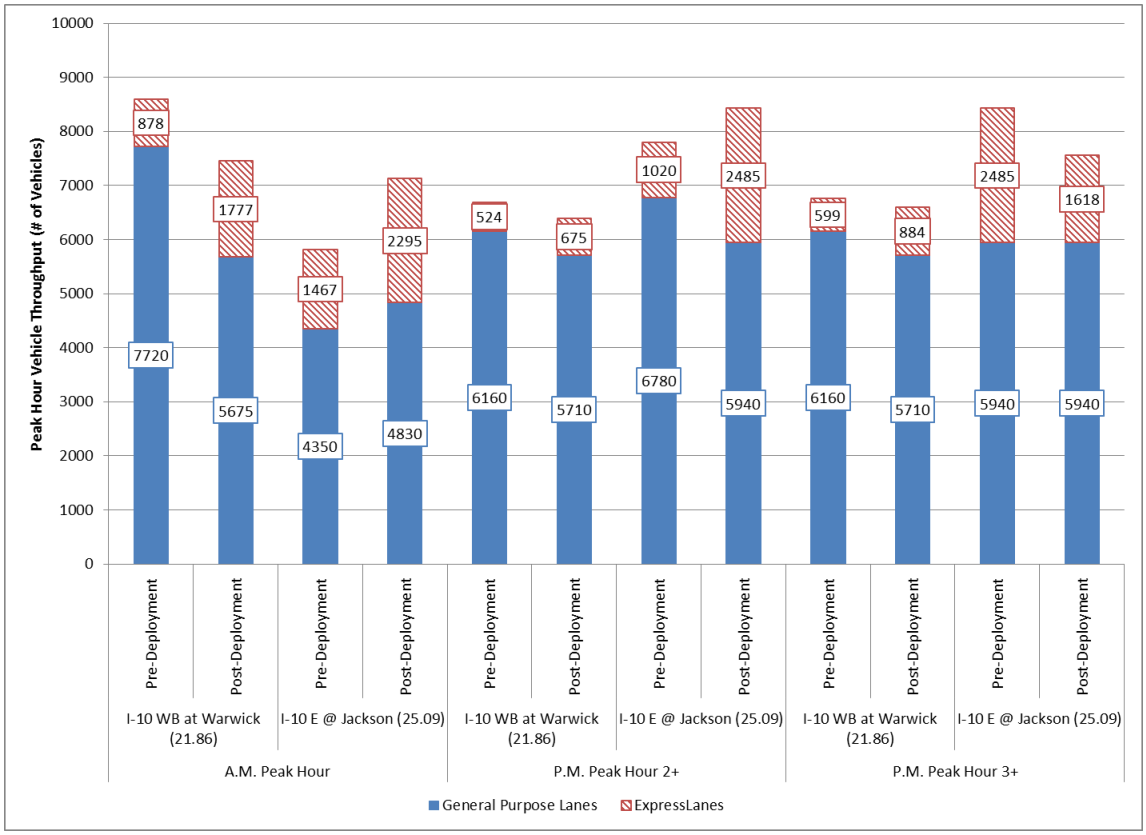
Source: Texas A&M Transportation Institute from data provided by Caltrans

Figure 3-10. Comparison of Pre-and Post-Deployment of Vehicle Throughput on I-110 by Lane Type.

3.1.2.2 Person Throughput

Person throughput is a measure of how many people, on average, move through a segment of highway during a specified period. For this study, person throughput was computed using the Caltrans Occupancy Count data. Person throughput was computed by multiplying the number of occupants associated with each occupancy category by the number of vehicles observed in each occupancy category. In computing person throughput, Caltrans assumed that all designated vanpool contained a total of 6 occupants. Different levels of occupancies were assumed for different categories of buses – those bused designated as "1/4 full" were assumed to have 10 occupants, "½ full" buses were assumed to have 20 occupants, and "full" buses were assumed to have 40 occupants. Motorcycles were assumed to be single occupant vehicles.

Table 3-9 shows the change in average peak hour person throughput in both the morning and evening commute peaks on I-110. Table 3-10 shows the change in average peak hour person throughput on I-10. It should be noted that because these values are based on an extremely limited number of vehicle occupancy counts performed in each evaluation period, they may not represent true trends for the corridor.



Source: Texas A&M Transportation Institute from data provided by Caltrans

Figure 3-11. Comparison of Pre-and Post-Deployment of Vehicle Throughput on I-10 by Lane Type.

Table 3-9. Change in Peak-Hour Person Throughput at Select Locations on I-110.

Lane Type	Average Peak Hour Person Throughput			
	Pre-Deployment	Post-Deployment	Change (# of Persons)	Percent Change
I-110 NB @ Adams (20.71) -- AM Peak Hour				
General Purpose Lanes	9498	9480	-18	-0.2%
ExpressLanes	2912	2602	-310	-10.7%
Total	**12410**	**12082**	**--328**	**-2.6%**
I-110 NB @ Slauson (17.98) -- AM Peak Hour				
General Purpose Lanes	6268	5523	-745	-11.9%
ExpressLanes	5989	5214	-755	-12.9%
Total	**12256**	**10737**	**-1519**	**-12.4%**
I-110 SB @ Slauson (17.98) -- PM Peak Hour				
General Purpose Lanes	6688	8353	1665	24.9%
ExpressLanes	6447	4758	-1689	-26.2%
Total	**13135**	**13111**	**-24**	**-0.2%**

Source: Texas A&M Transportation Institute based on data provided by Caltrans

Table 3-9 shows that the peak hour person throughput on I-110 in the morning commute period decreased by 328 persons at Adams and by 1519 persons at Slauson in the post-deployment period. These changes equate to difference of 2.6 percent and 12 percent at these locations. Most of the change that occurred at Adams was a result of the change in the peak-hour person-throughput in the ExpressLanes. At Slauson, the change in person throughput was equally distributed between the general purpose lanes and the ExpressLanes.

In the evening commute, changes in person throughput on I-110 were examined at Slauson only. At this location, total person throughput remained near pre-deployment conditions. However, the person throughput in the ExpressLanes decreased by 26.2 percent while person throughput in the general purpose lanes increased by almost 25 percent.

Table 3-10 shows the change in the average peak-hour person throughput at two locations – Warwick and Jackson -- on I-10 in the peak direction of travel for the morning and evening commute periods. The data shows that total person throughput is generally less in the post deployment period compared to the pre-deployment conditions. Again, because of the limited number of sample on which to base a conclusion, these variations could be a result of random daily fluctuation in traffic and less of an indicator in performance of the general purpose lanes or ExpressLanes.

Table 3-10. Change in Peak-Hour Person Throughput at Select Locations on I-10.

Lane Type		Peak Hour Vehicle Throughput			
		Pre-Deployment	Post-Deployment	Change (# of Persons)	Percent Change
I-10 WB @ Warwick (21.86)-- AM Peak					
General Purpose Lanes		8390	6335	-2055	-24.5%
ExpressLanes		4758	4286	-472	-9.9%
Total		**13148**	**10621**	**-2527**	**-19.2%**
I-10EB @ Warwick (21.86)-- PM Peak					
General Purpose Lanes		7070	7015	-55	-0.78%
ExpressLanes	2+ Occ.	2149	2444	295	13.73%
	3+ Occ.	3397	3379	-18	-0.53%
Total *		**10467**	**10394**	**-73**	**-0.7%**
I-10 WB @ Jackson (25.09)-- AM Peak					
General Purpose Lanes		4720	5408	688	14.6%
ExpressLanes		6288	4763	-1525	-24.3%
Total		**11008**	**10170**	**-838**	**-7.6%**
I-10 EB @ Jackson (25.09)-- PM Peak					
General Purpose Lanes		7650	7150	-500	-6.5%
ExpressLanes	2+ Occ.	2548	2414	-134	-5.3%
	3+ Occ.	3078	4237	1159	37.7%
Total *		**10728**	**11387**	**659**	**6.1%**

Source: Texas A&M Transportation Institute based on data provided by Caltrans

Figure 3-12 show the change in the relative contribution of the ExpressLanes to the total peak hour person throughput (expressed as a percentage of the total period throughput) on the I-110 and 1-10 respectively. The figure shows that with the exception of I-110 in the southbound direction at Slauson, the relative contribution of the ExpressLanes to the overall peak hour person throughput remained the same or increased in the post-deployment periods compared to the pre-deployment conditions.

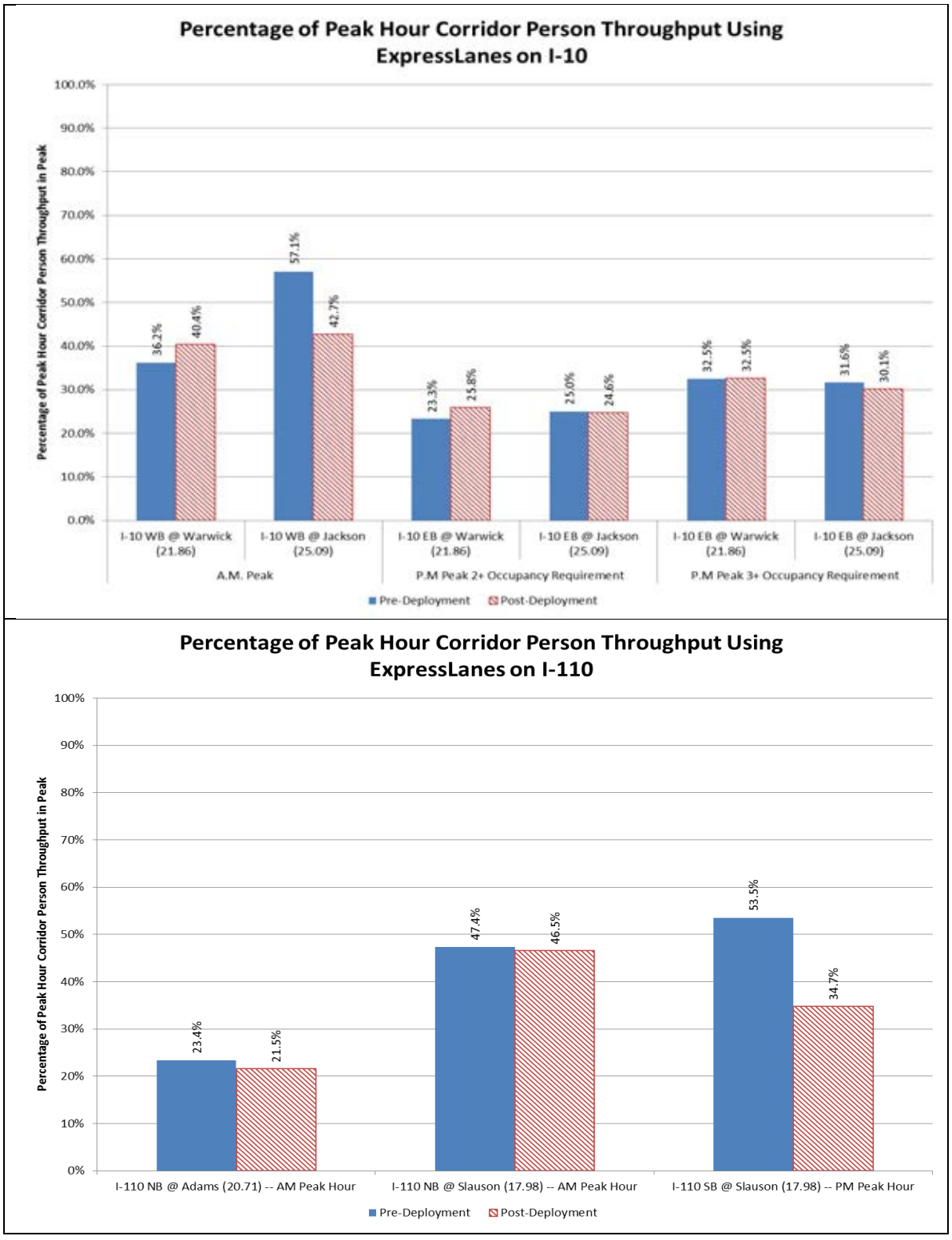
3.1.3 Post Evaluation Trends in Travel Time and Speeds

Additional travel time data were collected by Caltrans on both I-10 and I-110 to investigate ongoing trends in the corridors. This information is included here to highlight some ongoing trends in the corridor but is not part of the National Evaluation effort.

Figure 3-13 shows the results of recent travel times runs conducted in February and March, 2014 overlaid with the results of the CRD analysis for this same section of freeway for the morning commute. The results show recent degradation in the performance of the ExpressLanes on both I-10 and I-110. These results show average trip speeds on both the I-10 and I-110 ExpressLanes have

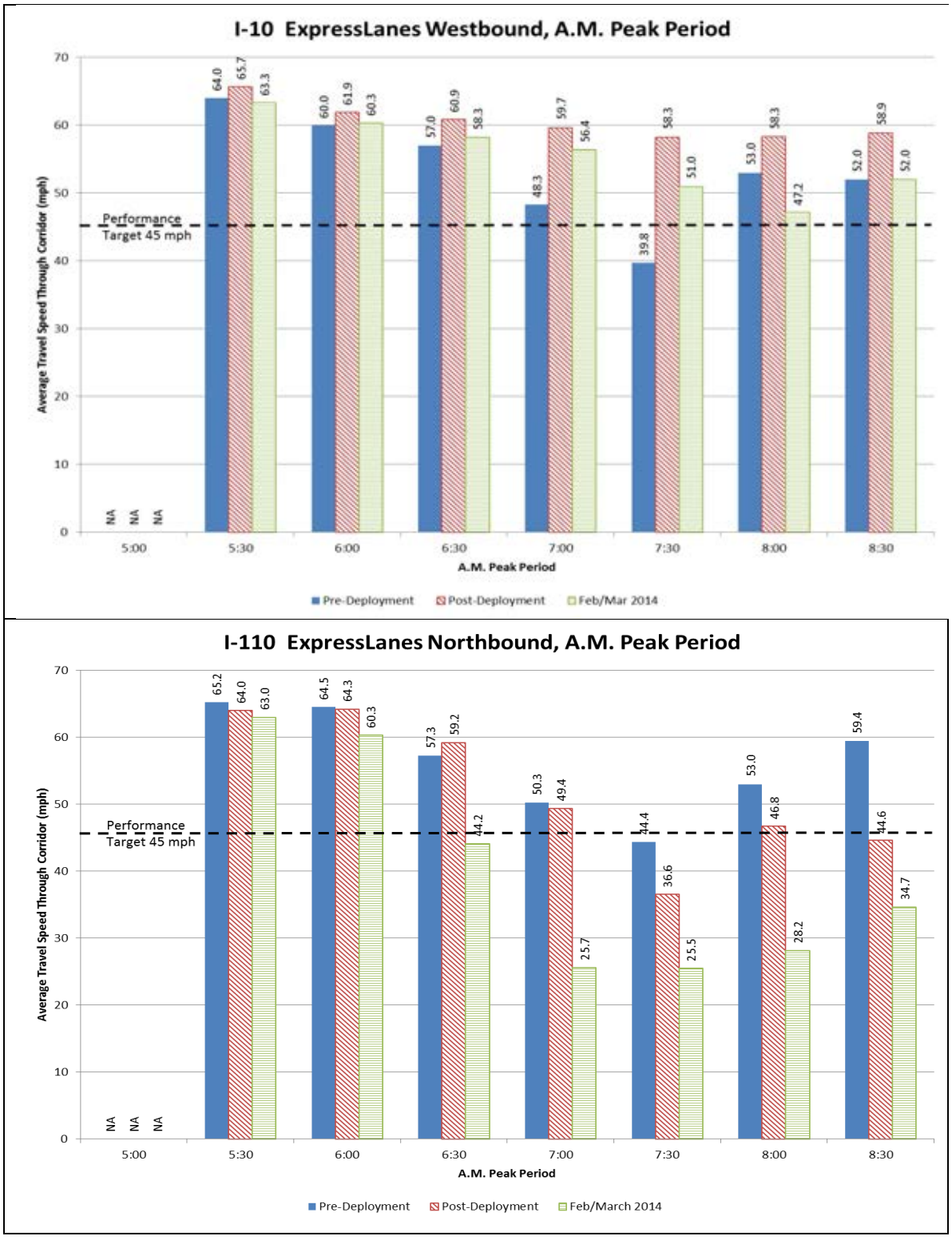
declined in February/March 2014 over the post-CRD deployment levels. Figure 3-13 shows that for the I-10 ExpressLanes in the westbound direction in the morning commute, average trip speeds declined between 3 and 11 mph in the ExpressLanes. Figure 3-13 also shows that average trip speeds on the I-110 ExpressLanes have reduced significantly; averaging around 25 mph from 7:00 a.m. to 8:00 a.m. The figure also shows that the trips speeds in the ExpressLanes average below 45 mph from 6:30 a.m. to 9:00 a.m.

Figure 3-15 shows a travel time profile for a single vehicle using the ExpressLanes on I-110 in the northbound direction during the morning commute. The figure was generated by Caltrans by plotting the speed of the vehicle as it travels through the corridor. The direction of travel is from left to right with the left end representing SR 91 and the right end representing Adams Boulevard. A trip where the vehicle was able to maintain a consistent speed throughout its trip would appear as a straight line running left to right. Drops in speed are represented by sudden downward spikes in the speed profile. A trip which experiences large fluctuation in speed (as typically occurs in congestion) would appear as a jagged line, with numerous peaks and valleys. While the profile is indicative of only one trip on the ExpressLanes, it can provide insight into where congestion is occurring on the facility. This profile indicates that this particular vehicle is encountering congestion approximately 1.5 miles upstream of the I-105 interchange and extending approximately 3 miles downstream of the I-105 interchange. This particular trip occurred at 7:42 a.m. which is consistent with where the largest changes in travel times are occurring in the ExpressLanes.



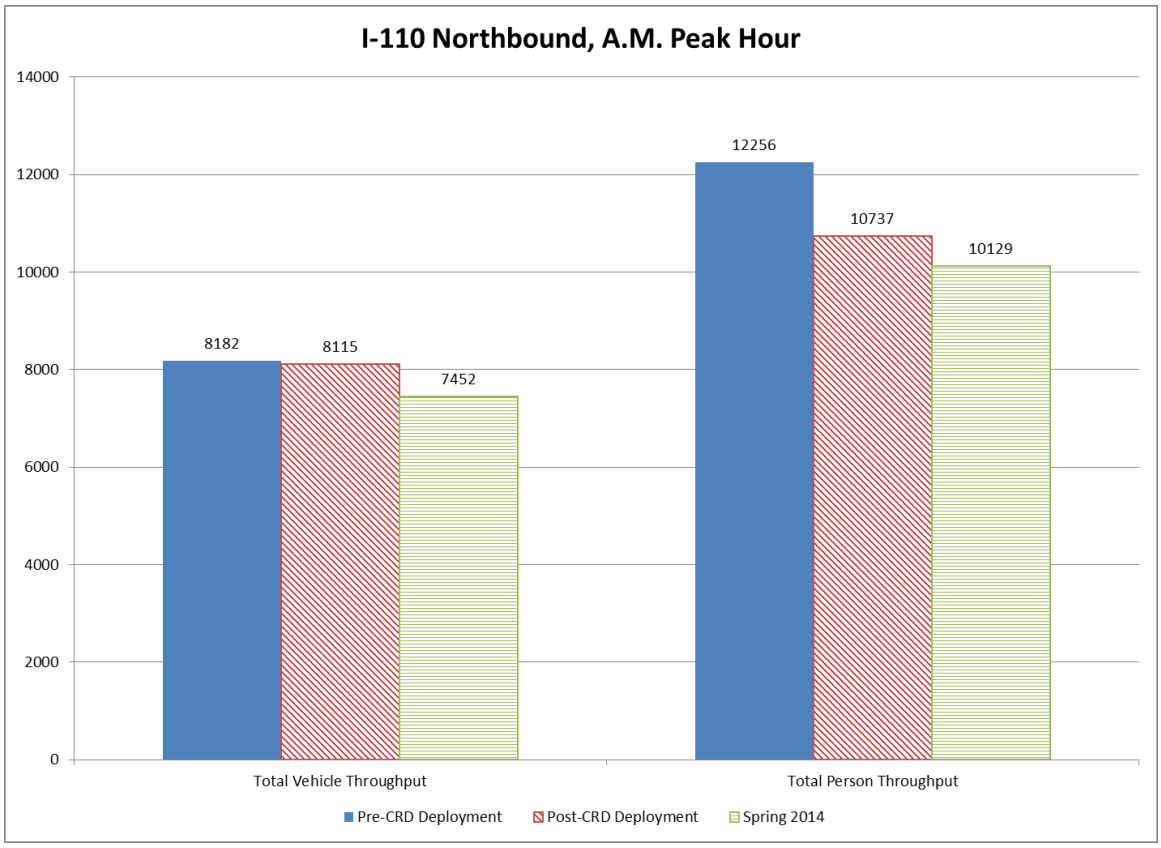
Source: Texas A&M Transportation Institute based on data provided by Caltrans

Figure 3-12. Relative Contribution of the ExpressLanes to the Total Peak-Hour Person Throughput on I-10 and I-110.



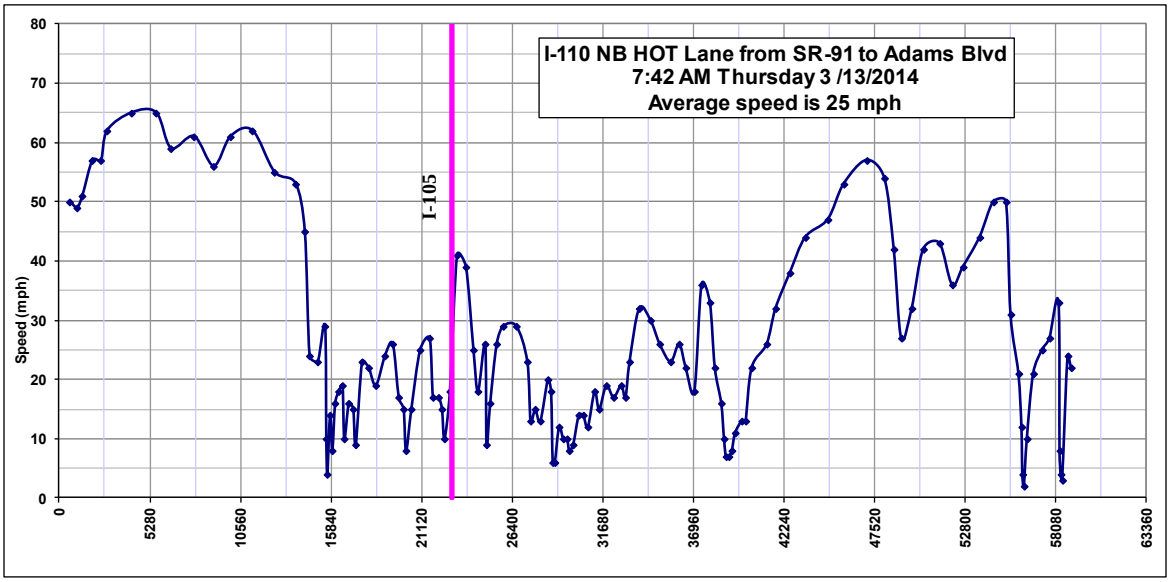
Source: Texas A&M Transportation Institute from data provided by Caltrans

Figure 3-13. Recent Trends in ExpressLanes Average Trip Speeds on I-10 Westbound and I-110 Northbound during the Morning Commute.



Source: Texas A&M Transportation Institute based data provided by Caltrans

Figure 3-14. Recent Trends in Total Peak Hour Vehicle and Person-Throughput on I-110 NB A.M. Peak Hour.



Source: Caltrans

Figure 3-15. Speed Profile of a Vehicle Traversing the I-110 CRD corridor in the Northbound direction during the Morning Commute.

3.2 Tolling Analysis

The tolling analysis examined the expansion and conversion of the existing HOV lanes on the I-110 and I-10 corridors into HOT lanes. The HOT lanes, (i.e., "ExpressLanes"); represent the first use of tolling in both corridors in Los Angeles County. The intent of the ExpressLanes is to provide additional mobility options and choices for travelers in vehicles not meeting the occupancy requirements, while maintaining travel time savings and trip-time reliability for buses, vanpools, and carpools. The 11-mile ExpressLanes on the I-110 opened on November 10, 2012 and the 14-mile ExpressLanes on the I-10 opened on February 23, 2013. The I-110 ExpressLanes includes two lanes in each direction of travel from the I-105 to Exposition Blvd. As part of the CRD, a second lane was added to the I-10 ExpressLanes from I-605 to I-710.

The user requirements on the I-110 and I-10 ExpressLanes reflect those in effect during the previous HOV operations. The I-110 HOV lanes operated with a HOV2 requirement 24 hours a day, 7 days a week (24/7). The I-110 ExpressLanes continue to provide toll-free HOV2 access on a 24/7 basis, with vehicles not meeting the current carpool occupancy requirement allowed to use the lanes by paying the posted toll. The HOV lanes on I-10 have had a variable-occupancy requirement since July 24, 2000. The I-10 HOV lanes were restricted to HOV3 on weekdays from 5:00 a.m. to 9:00 a.m. and from 4:00 p.m. to 7:00 p.m. The lanes were open to HOV2 use at all other times. The I-10 ExpressLanes allow HOV2 to use the lanes during the HOV3 restricted period by paying the posted toll, while continuing toll-free access at all other times. In addition, vehicles not meeting the carpool occupancy requirements can access the I-10 ExpressLanes at any time by paying the posted toll. Thus, the ExpressLanes on both freeways maintain the same access for the different HOV user groups, while expanding the eligible users to include toll-paying vehicles that do not meet the carpool occupancy requirement.

The analysis conducted for this technical memorandum examines the number of new toll accounts opened and FasTrak transponders issued. Information is also presented on the use of the ExpressLanes from the first full month of operation through the one-year deployment period. Specifically, the I-110 ExpressLanes data ranges from December 2012 through December 2013 (the last month of available data for this report). A 60-day grace period for violations was in effect on the I-110 ExpressLanes from the opening on November 10, 2012 through January 10, 2013. The I-10 ExpressLanes data ranges from February 2013 through December 2013. Similar to the I-110 ExpressLanes, a 60-day grace period for violations was in effect on the I-10 ExpressLanes from its opening on February 23, 2013 through April 23, 2013. Toll transactions, toll rates, toll revenues, and citations on the ExpressLanes are also discussed.

3.2.1 Data Sources

Metro provided the National Evaluation Team with data on new toll accounts opened and transponders issued from July 2012 to January 2014, and ExpressLanes transactions, the amount of time the ExpressLanes were closed to SOVs, gross toll revenue from November 2012 to December 2013, and citations issued by the California Highway Patrol (CHP). Information from various Metro reports, press releases, and news articles were also reviewed as part of this analysis.

3.2.2 Using the ExpressLanes

The I-110 and I-10 ExpressLanes use FasTrak, an electronic toll data collection system allowing drivers to travel through designated FasTrak-only lanes without stopping. All drivers, including carpools, need a FasTrak transponder to use the ExpressLanes. Motorcycles were initially required to obtain a transponder, but that requirement was removed in February 2013 due to software improvements by the toll system that enabled automatic identification of a motorcycle without a transponder. Alternative fuel vehicles with white and green California Clean Air stickers traveling as an SOV were charged a toll during the demonstration period. Effective February 24, 2014, these vehicles were allowed to travel toll-free irrespective of occupancy with a FasTrak transponder.

Individuals must have a switchable FasTrak transponder to travel as a toll-free carpool in the I-110 and I-10 ExpressLanes. Motorists set the transponder switch to the position corresponding with the number of occupants (1, 2, or 3+) before entering the lanes. In signing the FasTrak Application and License Agreement, individuals agree to "accurately set the self-declaration switch to indicate the actual number of occupants in the vehicle prior to traveling on the ExpressLanes." They further agree to pay the single occupant toll rate if they fail to properly set the transponder to the accurate occupancy status prior to entering the ExpressLanes. Through the aid of enforcement beacon lights, dedicated California Highway Patrol (CHP) officers provide additional enforcement during the peak periods and issue citations to motorists who are found to have the self-declaration switch in the incorrect position.

The Carpool Loyalty Program and the Transit Rewards Program provide additional incentives and benefits to ExpressLanes carpoolers and bus riders. The Carpool Loyalty Program automatically enters ExpressLanes FasTrak account holders using the lanes as a carpooler into monthly drawings for gift cards. During the demonstration period, 520 gift cards were issued. The Transit Rewards Program allows frequent bus riders to earn toll credits for use on the ExpressLanes. Using their registered TAP card, riders earn a $5 toll credit by taking 32 one-way trips during the peak hours on the I-110 and I-1 ExpressLanes. The reward credits are not transferrable and expire after 90 days. During the demonstration period, 5,782 accounts were enrolled in the program, earning $12,870 in toll credits.

The Metro Vanpool Program offers up to a $400 monthly lease subsidy – not to exceed 50 percent of the lease costs – for commuter vanpools of 7-to-15 passengers that have a destination to a Los Angeles County worksite for which a completed program application and agreement has been submitted and approved by Metro. Vanpools are also enrolled in a Loyalty Program, providing the opportunity to earn gift cards. A total of 117 vanpools using either or both the I-110 and I-10 ExpressLanes, were established from July 2012 through February 2014, surpassing the goal of 100 new vanpools. A total of 33 vanpools use the I-110 ExpressLanes, 78 use the I-10 ExpressLanes, and 6 use both.

3.2.3 ExpressLanes Accounts and Transponders

Table 3-11 presents the number of new FasTrak accounts opened and transponders issued from July 2012 to January 2014. A total of 204,155 accounts were opened during the 19-month period, with 253,139 transponders issued. These figures exceed the goal of 100,000 transponders in circulation at the end of the demonstration period. The month with the largest number of new accounts opened and transponders issued was November 2012, corresponding to the opening of the I-110 ExpressLanes, with a total of 25,383 accounts and 31,850 transponders. March 2013 was the second highest month for new accounts and transponders, reflecting the opening of the I-10 ExpressLanes in February 2013. The demand for new accounts and transponders has leveled off, it continues to remain stable.

Table 3-11. ExpressLanes – New FasTrak® Accounts Opened and Transponders Issued.

	Accounts Opened			Transponders Issued
	Personal Accounts	Business Accounts	Total Accounts	
2012				
July	1,297	34	1,331	1,590
August	3,187	40	3,227	2,465
September	6,475	81	6,556	4,419
October	2,918	199	3,117	9,799
November	24,875	508	25,383	31,850
December	16,904	248	17,152	21,511
2013				
January	12,377	676	13,053	15,982
February	17,893	199	18,092	21,710
March	20,850	189	21,039	25,009
April	15,438	162	15,600	18,600
May	12,071	141	12,212	14,972
June	10,535	118	10,653	13,142
July	9,602	139	9,741	11,997
August	10,044	100	10,144	13,346
September	8,826	117	8,943	11,138
October	8,362	101	8,463	10,663
November	7,014	92	7,106	9,066
December	5,832	89	5,891	7,401
2014				
January	6,367	85	6,452	8,479
TOTAL	**200,867**	**3,318**	**204,155**	**253,139**

Source: Metro

Two types of FasTrak accounts are available — personal accounts and business accounts. Personal accounts may have up to four transponders, while business accounts may have five or more transponders. Approximately 98 percent of the new accounts opened over the 19-month period were personal accounts and 2 percent were business accounts. Individuals can register for a transponder online, by mail, by telephone, at Metro service centers, and at participating retail outlets, which include Albertsons, Costco, and the AAA Automobile Club of Southern California. Initially, approximately 65 percent of all new accounts were opened at participating retail outlets, with 29 percent opened through the Metro website, 5 percent opened at walk-in centers, and 1 percent by mail and telephone. These percentages appear to have held constant over time.

The ExpressLanes is the first HOT operation in the country to offer a discount for low-income commuters, known as the "Equity Plan." Qualifying residents of Los Angeles County receive a $25 credit when they set up an account (proof of eligibility required). This credit can then be applied to either the transponder deposit or pre-paid toll deposit. The monthly $3 account maintenance fee is waived. As of the end of December 2013, a total of 4,329 Los Angeles County households were enrolled in the equity plan, accounting for $108,225 in toll/transponder credits.

3.2.4 Toll Transactions and Use of the I-110 and I-10 ExpressLanes

Metro provided the national evaluation team with toll trip data on a regular basis over the course of the demonstration. The toll trip data examined for this report cover the period from December 2012 through December 2013 on the I-110 ExpressLanes and February 2013 through December 2013 on the I-10 ExpressLanes. A grace period for violators was in effect for the first 60 days of operation on the I-110 ExpressLanes and the I-10 ExpressLanes.

The trip data is compiled by first recording ExpressLanes transactions as either an ETC transaction or a violation for each vehicle. The data is then processed through the back office to determine the source of the account posting. After posting, the trips are categorized as California Toll Operators Committee (CTOC), electronic toll collection (ETC), non-revenue (Non-Rev), pay by plate (PBP), and violation. An initial ETC transaction is posted as a CTOC, ETC, or Non-Rev transaction. A violation transaction will result in a CTOC, Non-Rev (those read by plate), PBP, or violation. The only Non-Rev account with a transponder is the Freeway Service Patrol. All other non-revenue transactions are processed by reading the plate and forming a trip, which is posted as a PBP trip. Publically and privately operated buses are not required to have a transponder. Lane transactions for these buses are initially read as lane violations, but then classified as a non-revenue trip in the back office processing.

The national evaluation team examined the toll trip data in two ways. First, the total number of trips – including CTOC, ETC, Non-Rev, PBP, and violation – was reviewed. Second, the toll trip data were aggregated following the method Metro uses to summarize trips. This method presents single occupant, HOV2 and HOV3 categories. It allocates the Non-Rev transactions, which include public and private buses, to the 2+ category on I-110 and the 3+ category on I-10. The violations are not included in the summary as the number of occupants is not known.

The majority of trips in the HOV2 and HOV3 categories represent self-declared carpoolers. Enforcement of the toll and HOV requirements are discussed more extensively in the next section. The summary here is intended to highlight changes in toll transaction types over the course of the demonstration. The information presented does not represent a before-and-after assessment of changes in carpooling. Both Metro and Caltrans observed variances in the observed occupancy discussed in the congestion section and the self-declared occupancy from the transponder setting toll

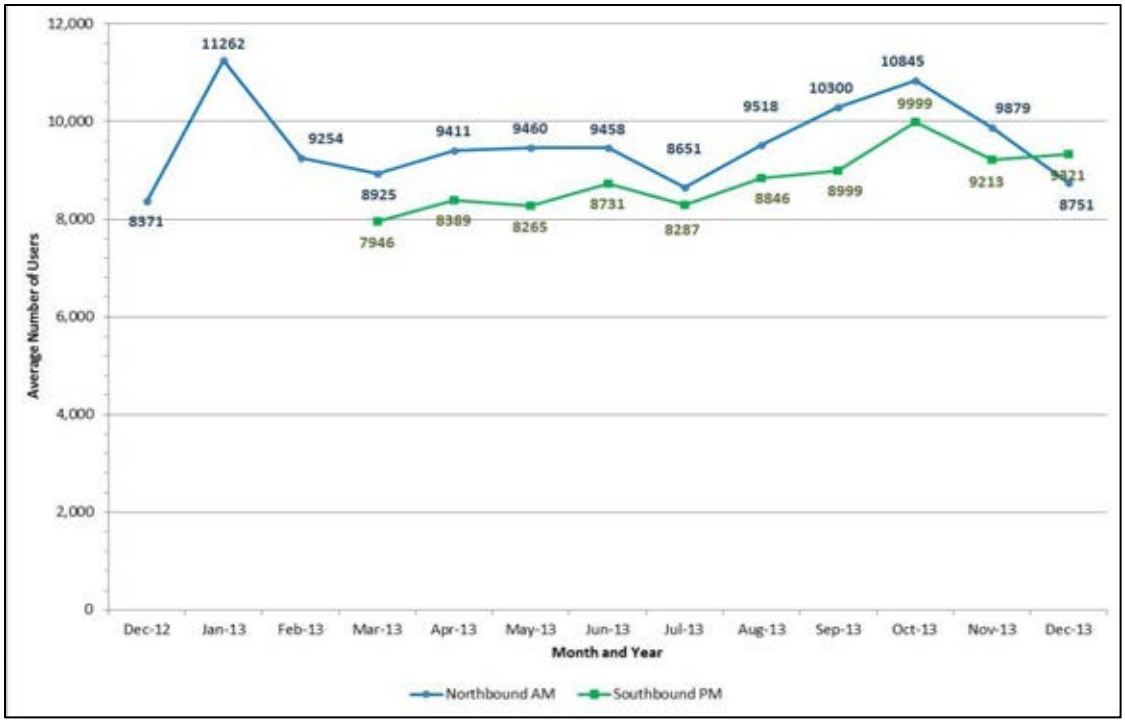
data. These differences, which focus on self-declared transponder settings indicating higher use levels than the visual occupancy data, are being examined in more detail by the agencies.

Use of the I-110 ExpressLanes and the I-10 ExpressLanes during the peak periods in the peak direction of travel was examined from the toll trip data provided by Metro. The morning peak period was defined as 5:00 a.m.-to-9:00 a.m. (4 hours) and the afternoon peak period was defined as 4:00 p.m.-to-7:00 p.m. (3 hours). The morning peak hour was defined as 7:00 a.m.-to-8:00 a.m. and the afternoon peak hour was defined as 5:00 p.m.-to-6:00 p.m. The peak direction of travel on the I-110 is northbound into downtown Los Angeles in the morning and southbound in the afternoon. The peak direction of travel on the I-10 is westbound into downtown Los Angeles in the morning and eastbound in the afternoon.

The data were aggregated into average daily peak period and peak hour transactions in the peak travel direction by month. The analysis presented here provides a general indication of trends in ExpressLanes use. Figure 3-16 presents the I-110 ExpressLanes average morning and afternoon peak period use in the peak direction. Figure 3-17 presents the same information for the I-10 ExpressLanes. In both cases, the morning peak period reflects a four hour total and the afternoon peak period reflects a three hour total. Figure 3-18 and Figure 3-19 present average monthly peak hour use by peak direction for the I-110 and I-10 ExpressLanes, respectively.

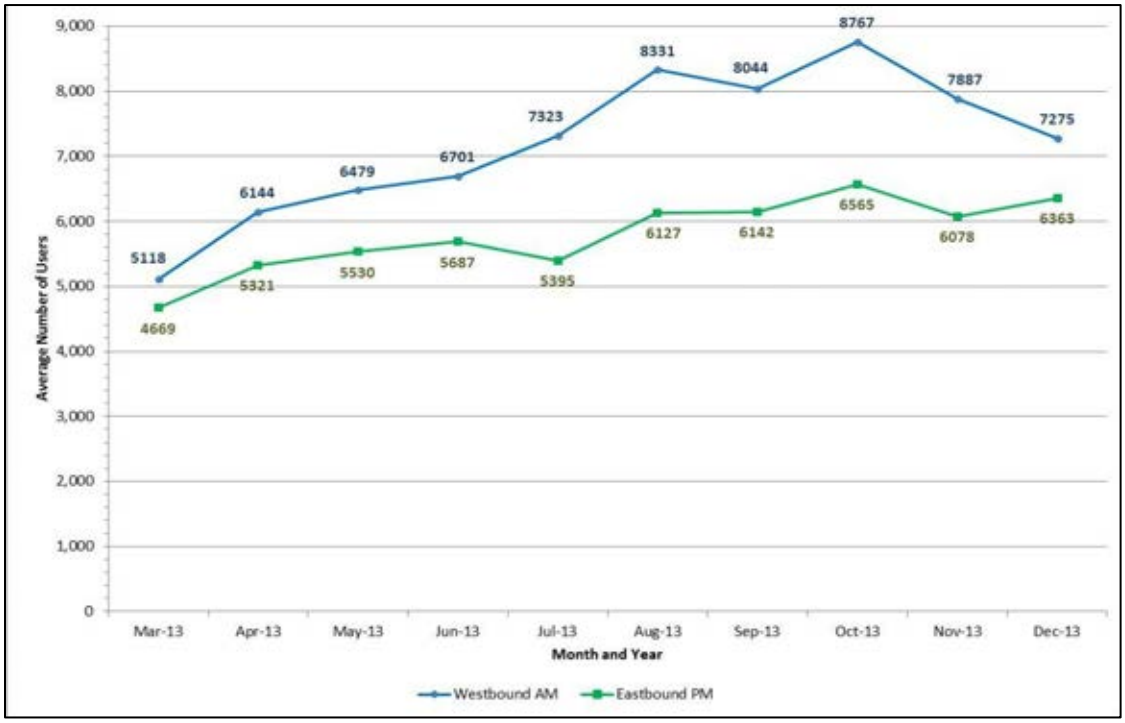
The figures show steady growth overall in the use of both facilities, with slightly lower averages during the holiday months, primarily July, November, and December. Figure 3-18 and Figure 3-19 also indicate slightly higher use levels during the morning peak hour than during the afternoon hour. This trend reflects the general pattern of more concentrated trip times in the morning and slightly more dispersed trip times in the afternoon.

Figure 3-20 and Figure 3-21 present the average morning and afternoon peak period peak direction toll trips by type for the I-110 and the I-10 ExpressLanes. Figure 3-22 and Figure 3-23 highlight the same information for the peak hour peak direction of travel. The figures show an overall increase in HOV2 and HOV3 toll trips, which represent self-declared 2+ and 3+ carpools, as well as buses, vanpools, motorcycles and exempt vehicles on the I-110 and the I-10 ExpressLanes, and increases in toll paying HOV2 vehicles and SOVs. The level of self-declaring HOV3 FasTrak trips is of interest given the national experience indicating the difficulty of forming and maintaining 3 person carpools. The figures also indicate that self-declaring HOV2 and HOV3, vanpools, buses, motorcycles, and other exempt vehicles represented between 54 percent and 59 percent of the peak period and peak hour FasTrak trips on the ExpressLanes during the demonstration.



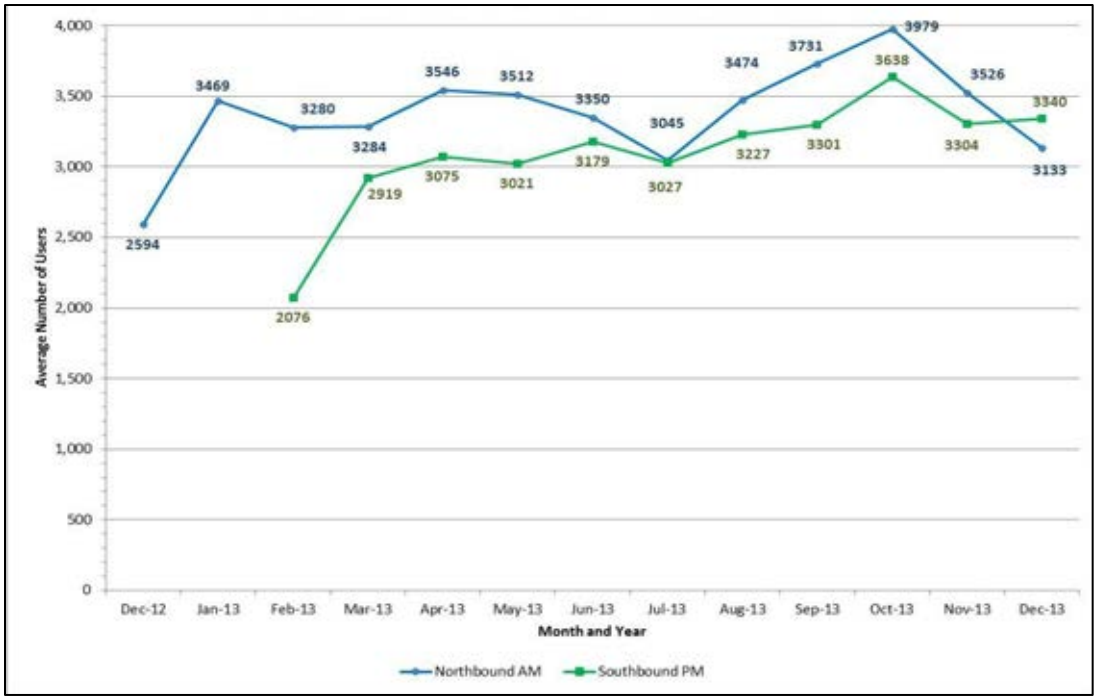
Source: Data from Metro

Figure 3-16. I-110 Average Monthly Morning and Afternoon Peak Period, Peak Direction, Toll Trips.



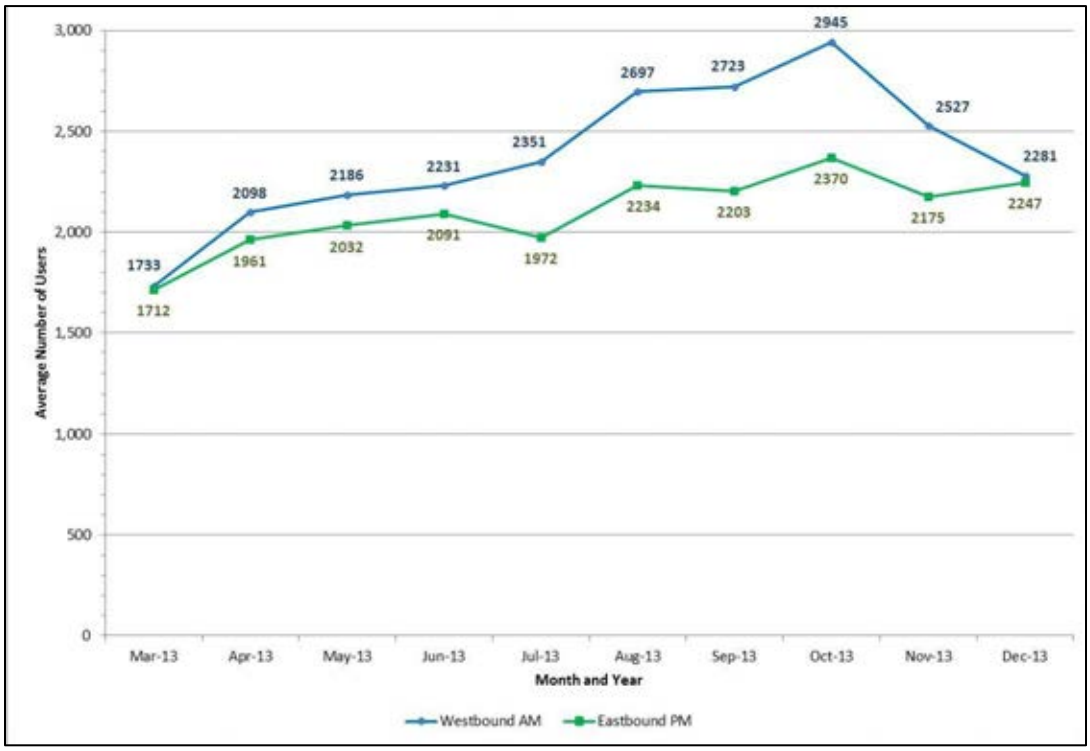
Source: Data from Metro

Figure 3-17. I-10 Average Monthly Morning and Afternoon Peak Period, Peak Direction, Toll Trips.



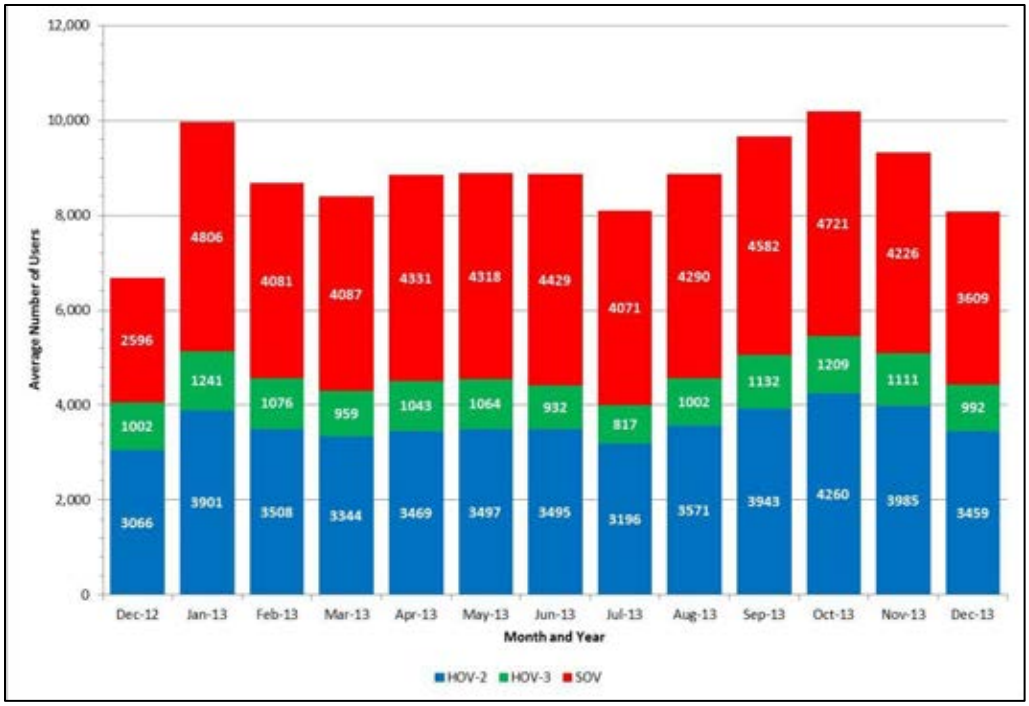
Source: Data from Metro

Figure 3-18. I-110 Average Monthly Morning and Afternoon Peak Hour, Peak Direction, Toll Trips.



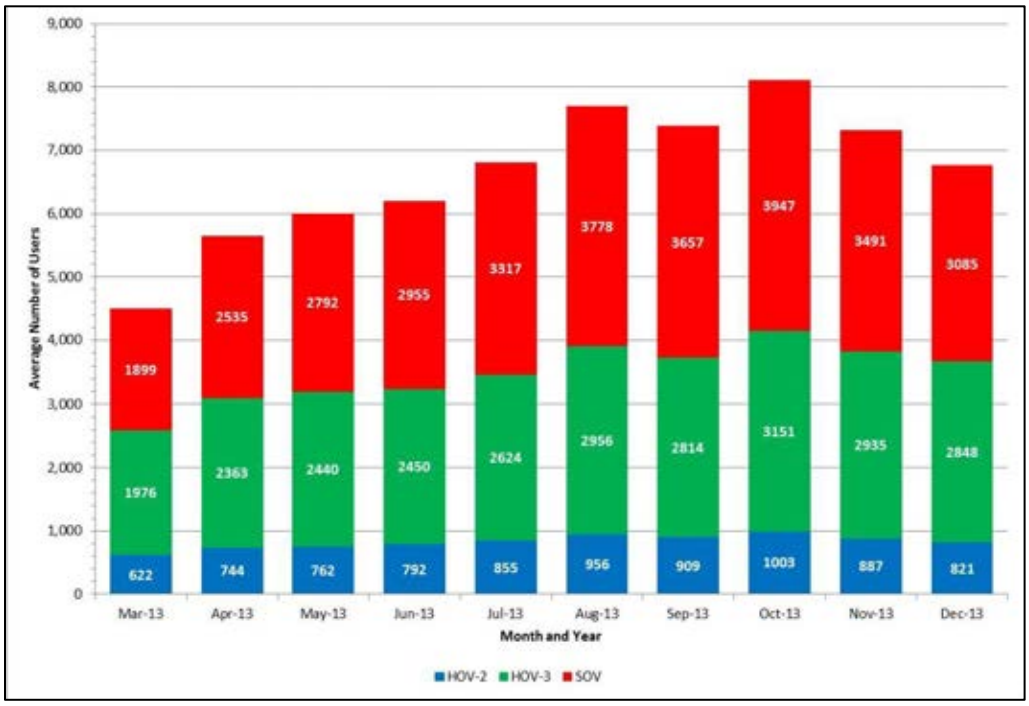
Source: Data from Metro

Figure 3-19. I-10 Average Monthly Morning and Afternoon Peak Hour, Peak Direction, Toll Trips.



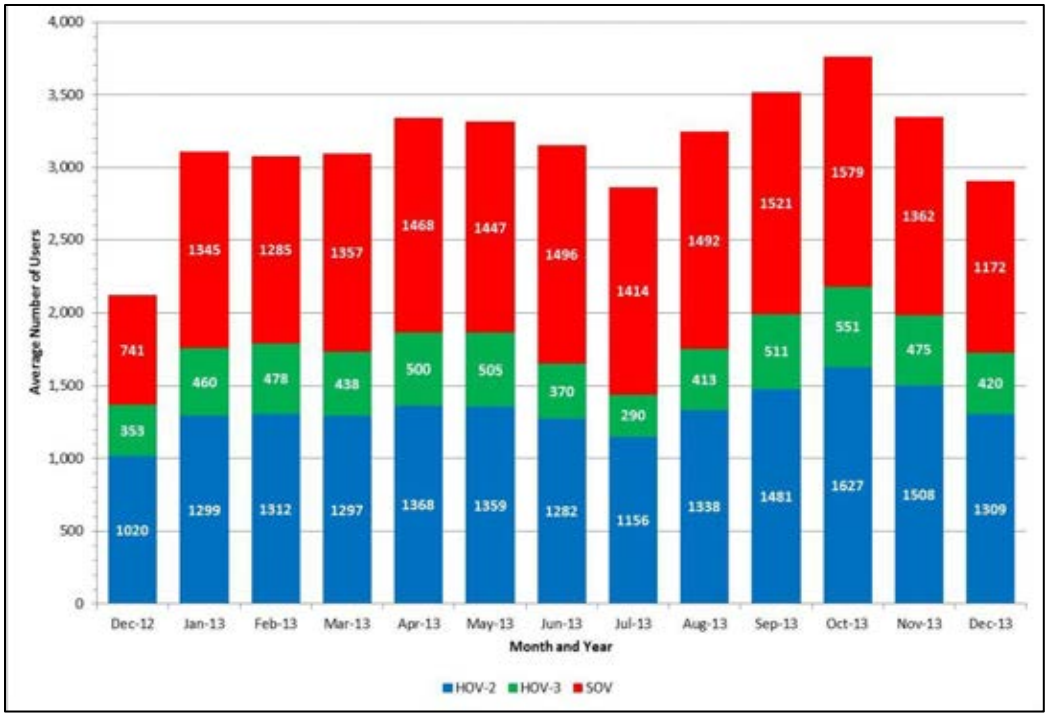
Source: Data from Metro

Figure 3-20. Average Monthly AM Peak Period, Peak Direction, Toll Trips By Type – I-110.



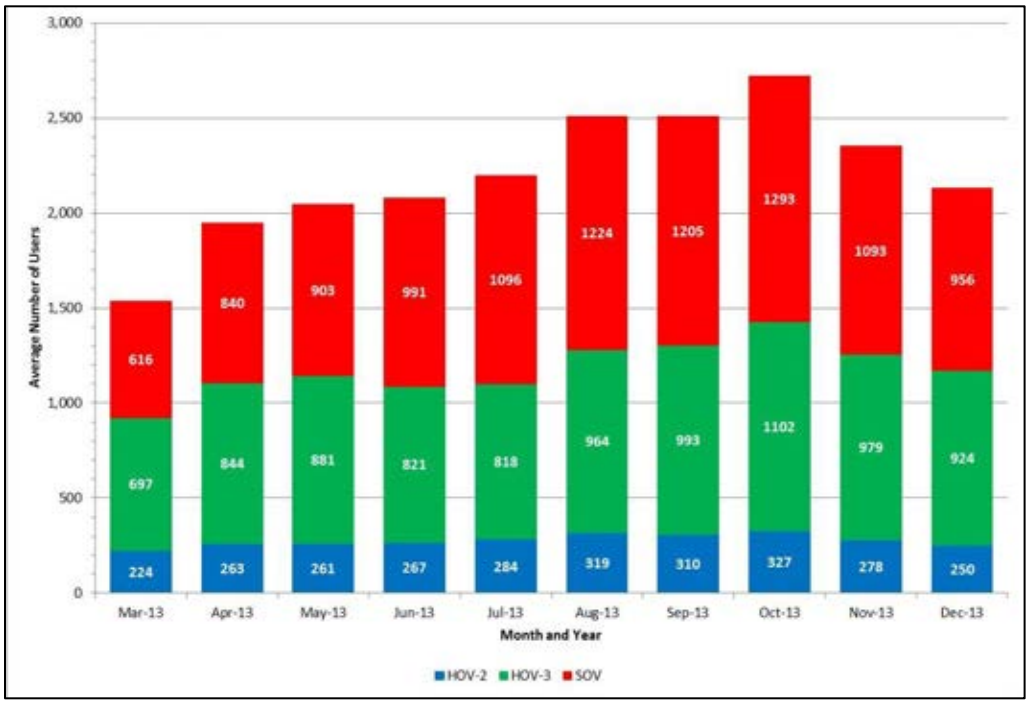
Source: Data from Metro

Figure 3-21. Average Monthly AM Peak Period, Peak Direction, Toll Trips by Type – I-10.



Source: Data from Metro

Figure 3-22. Average Monthly AM Peak Hour, Peak Direction, Toll Trips By Type – I-110.



Source: Data from Metro

Figure 3-23. Average Monthly, AM Peak Hour, Peak Direction, Toll Trips By Type – I-10.

The national evaluation team also examined the frequency of ExpressLanes use by different toll trip types on a monthly basis. Overall, the HOV toll trips represented a larger percentage of the frequent users, defined as one-to-two daily trips during the weekday, with SOVs representing a larger percentage of the infrequent users, defined as one-to-four trips a month.

Metro has the option to close the lanes to vehicles not meeting the carpool occupancy requirements in the event that travel speeds are degraded in the ExpressLanes. The tolling algorithm calculation is used and the system automatically posts the closure message on the Dynamic Message Signs (DMS). The system records the number of minutes the ExpressLanes are closed to SOVs. The ExpressLanes on the I-110 were closed to SOVs for approximately 30 hours in the 14 months of operation from November 2012 to December 2013. September and October 2013 represented the months with the largest number of closed minutes on the I-110 ExpressLanes. In September, the I-110 ExpressLanes were closed to SOVs for 10 hours, or 1.4 percent of the total operating time, and for 5 hours in October, or 0.7 percent of the total operating time. The I-10 ExpressLanes were only closed to SOVs for approximately 6 hours for the 10-month period from February to December 2013.

3.2.5 Enforcement

Both electronic and manual visual enforcement are used on the I-110 and I-10 ExpressLanes. The FasTrak system records vehicles without an active transponder. When a vehicle enters a HOT lane without a transponder it is considered to be in violation and the vehicle's license plate is recorded and identified. The toll system first reviews the database to determine if the license plate is assigned to an existing FasTrak customer account or an authorized Non-Revenue account (i.e., publically and privately operated buses and other vehicles). When the system determines that the license plate is not in the toll database a violation notice is then sent to the address at which the vehicle is registered. When such violations occur, the toll incurred plus the violation penalty are billed and mailed to the violator. The violator then has 14 days to pay the toll and only 30 days to pay the toll and violation penalty of $25. If the violator does not pay the toll and penalty within 30 days, they are billed an additional $30. However, a 60-day grace period was in place at the beginning of the I-110 ExpressLanes and the I-10 ExpressLanes deployment. During this grace period, no violation penalties were assessed. If someone drove in the ExpressLanes without a FasTrak transponder, they were only billed for the toll incurred.

The number of monthly toll violation trips recorded in the toll trip data was examined. The number of toll violation trips was highest during the initial months of operation on the I-110 ExpressLanes and the I-10 ExpressLanes. These months correspond to the grace period and reflect a typical ramp-up period for a toll facility. From March through December 2013, the number of violation toll trips recorded during the A.M peak hour, peak direction on the I-10 ExpressLanes ranged from 140 toll trips to 224 toll trips, representing approximately 6 percent-to-7 percent of the total toll trips during that time period. Violation toll trips recorded on the I-110 ExpressLanes during the same time period ranged from 186-to-232, representing approximately 6 percent-to-7 percent of the total toll trips. As noted previously, violation notices are sent to the owners of these vehicles.

The electronic toll collection system only addresses vehicles without a transponder or a non-active account. A combination of electronic monitoring and visual enforcement is used to address violations of the self-declared occupancy requirements. CHP officers provide extra enforcement on the I-10 and I-110 ExpressLanes during the morning and afternoon peak periods. The CHP officers are assisted by a beacon light, which indicates the transponder setting of vehicles passing a toll reader. The officers issue both verbal warnings and citations to drivers without valid transponders and drivers of vehicles without the number of occupants to meet the self-declared transponder setting. During the demonstration period, the monthly number of verbal warnings on the I-110 ExpressLanes ranged from

57-to-133, with the monthly number of citations ranging from 108-to-201. On the I-10 ExpressLanes, the monthly number of verbal warnings ranged from 77-to-164, and the number of citations ranged from 113-to-226.

3.2.6 Toll Rates

Table 3-12 presents the monthly average posted toll and the maximum posted toll for the morning and the afternoon peak periods, in the peak direction of travel. The tolls are dynamically priced and updated every five minutes based on real-time traffic conditions in the ExpressLanes. The minimum toll rate is $0.25 per mile and the maximum is $1.40 per mile. Further, tolls in the morning and afternoon peak periods for the full trip on the ExpressLanes must be at least 1.5 times the Metro Bus Rapid Transit fare of $2.45.

On the I-110 ExpressLanes, both the monthly average posted tolls and the maximum posted tolls were higher in the morning peak period. The lowest averaged posted toll in the morning peak period was $5.04 in July 2013 and the highest was $7.63 in October 2013. The lowest monthly maximum posted toll was $8.00 in February 2013 and the highest was $14.55 in November 2013. In the afternoon peak period, peak direction on the I-110 ExpressLanes, the lowest monthly average toll was $3.33 in July 2013 and the highest was $4.79 in December 2012. The lowest posted monthly maximum toll was $3.95 in December 2013 and the highest was $8.19 in November 2012.

On the I-10 ExpressLanes, the monthly average posted toll in the morning peak period, peak direction ranged from a low of $4.25 in March 2013 to a high of $5.20 in October 2013. The monthly average maximum toll during the same time period ranged from a low of $7.00 in April, May, and June 2013 to a high of $9.05 in September 2013. The lowest afternoon peak period, peak direction average monthly toll on the I-10 ExpressLanes was $4.50 in November and December 2013 and the highest was $5.46 in August 2013. The lowest maximum posted toll on the I-10 ExpressLanes in the afternoon peak period, peak direction was $4.90 in December 2013 and the highest was $7.30 in August 2013.

Table 3-12. I-110 and I-10 Monthly Average and Maximum Posted Tolls – Morning and Afternoon Peak Period, Peak Direction.

Peak Period	Month	Average Posted Toll		Maximum Posted Toll	
		I-110	I-10	I-110	I-10
Morning (Northbound)	Nov 2012	$5.40	—	$10.85	—
	Dec 2012	$5.57	—	$10.55	—
	Jan 2013	$5.33	—	$10.10	—
	Feb 2013	$5.25	—	$8.00	—
	Mar 2013	$5.36	$4.25	$10.05	$7.20
	Apr 2013	$5.35	$4.48	$9.95	$7.00
	May 2013	$6.19	$4.70	$11.00	$7.00
	Jun 2013	$5.93	$4.68	$12.30	$7.00
	Jul 2013	$5.04	$4.54	$12.35	$7.20
	Aug 2013	$6.36	$4.92	$11.95	$7.25
	Sep 2013	$7.21	$5.10	$14.25	$9.05
	Oct 2013	$7.63	$5.20	$14.35	$8.30
	Nov 2013	$7.05	$4.90	$14.55	$8.00
	Dec 2013	$6.54	$4.75	$14.05	$7.30
Afternoon (Southbound)	Nov 2012	$4.65	—	$8.10	—
	Dec 2012	$4.79	—	$7.50	—
	Jan 2013	$4.59	—	$7.05	—
	Feb 2013	$4.73	—	$7.45	—
	Mar 2013	$4.27	$4.95	$6.15	$6.85
	Apr 2013	$4.02	$5.22	$4.85	$6.95
	May 2013	$4.02	$5.32	$4.95	$6.95
	Jun 2013	$3.81	$5.40	$5.55	$6.95
	Jul 2013	$3.33	$5.12	$4.95	$6.95
	Aug 2013	$3.84	$5.46	$5.15	$7.30
	Sep 2013	$3.42	$5.11	$5.30	$6.75
	Oct 2013	$3.50	$4.83	$4.65	$5.60
	Nov 2013	$3.35	$4.50	$5.10	$5.30
	Dec 2013	$3.41	$4.50	$3.95	$4.90

Source: Metro

3.2.7 Toll Revenues

Table 3-13 presents the gross revenue from toll-paying vehicles not meeting the carpool occupancy requirements using the I-110 and I-10 ExpressLanes for the 14-month period from November 2012 through December 2013. The total gross revenues reported are from the electronic toll transactions only. Revenues from toll violations, violation penalties, and other fees are not included. The changes in revenues reflect the changes in use of the ExpressLanes described previously.

Table 3-13. Total Gross Revenue for I-110 and I-10 ExpressLanes*.

	Gross Toll Revenue	
Month	**I-110**	**I-10**
2012		
November	$387,042	—
December	$885,316	—
2013		
January	$881,315	
February	$986,998	$33,179
March	$1,293,556	$535,166
April	$1,135,103	$562,575
May	$1,580,153	$785,134
June	$1,156,887	$618,309
July	$1,021,259	$623,845
August	$1,366,270	$809,733
September	$1,283,006	$809,907
October	$1,515,030	$890,516
November**	$658,666	$853,253
December**	$2,007,099	$762,976
Total	**$16,157,700**	**$7,284,593**

*The total gross revenues reported are from the electronic toll transactions only. Revenues from toll violations, violation penalties, and other fees are not included.

**A fiber cut in November 2013 delayed applying transaction revenue until December 2013.

Source: Metro

The results of the tolling analysis indicate that the number of new FasTrak accounts and transponder sales exceeded the initial goal, and individuals continue to open new FasTrak accounts and obtain switchable transponders. The number of trips on the ExpressLanes by all groups – self declaring toll-free HOV2s and HOV3s, toll-paying HOV2s and SOVs, as well as vanpools, buses, motorcycles, and other exempt vehicles – increased over the course of the demonstration. The Equity Plan, the Carpool Loyalty Program, the Transit Rewards Program, and the Vanpool Program appear to be well received and well used by qualifying individuals. The ExpressLanes are providing choices to travelers

in the I-110 and I-10 corridors. Even with the discrepancies in the visual occupancy counts and self-declared FasTrak transponder settings that are being examined in more detail by Metro and Caltrans, the level of self-declaring HOV3 FasTrak trips over the course of the demonstration is of interest given the national experience highlighting the difficulty in forming and maintaining 3-person carpools.

3.3 Transit Analysis

The transit analysis investigates whether the LA CRD (ExpressLanes) Program has increased ridership and facilitated a mode shift to transit contributing to congestion mitigation. It also investigates whether transit performance has improved. For this analysis, the transit data was aggregated and analyzed by corridor (i.e. I-110 and I-10).

The I-110 ExpressLanes began toll operations on November 10, 2012. The I-10 ExpressLanes began toll operations on February 23, 2013. The LA CRD (ExpressLanes) Program included multiple transit-related improvements. First and foremost was the purchase of 59 new clean-fuel buses to enhance Silver Line and municipal bus service in the two corridors. The extra service was phased in as shown in Table 3-14.

Table 3-14. CRD-Funded Transit Service Changes.

Effective Date	Agency	Service Change
June 2011	LACMTA	• Peak period headways of I-110 portion of Silver Line changed from 30 minutes to 15 minutes.
June 2012	LACMTA	• Peak period headways of I-110 portion of Silver Line changed from 15 minutes to 10 minutes.
October 2012	Gardena Transit	• Peak period headway of Line 2 changed from 30 minutes to 15 minutes.
October 2012	Torrance Transit	• New Line 4 express bus created to go to downtown LA via I-110 ExpressLanes
December 2012	Foothill Transit	• 13 morning peak period trips and 8 afternoon peak period trips added to the Silver Streak on I-10. • 4 morning peak period and 14 afternoon peak period trips added to the Route 699 on I-10.
June 2013	LACMTA	• Silver Line Saturday service headways on I-110 changed from 40 minutes to 20 minutes and Sunday service headways changed from 60 minutes to 30 minutes.

Source: Metro

The LA CRD (ExpressLanes) Program included several other transit-related improvements. In downtown Los Angeles, TPS technology was installed at 15 intersections on Figueroa Street between Wilshire Blvd. and Adams Blvd. and at 5 intersections on Flower Street between Wilshire Blvd. and Olympic Blvd. The TPS was activated on November 9, 2012. Between August 2009 and November 2012, various safety-related upgrades were made at the Harbor Gateway Transit Center on I-110. These included better lighting, new security cameras, bicycle lockers, and a new L.A. County Sheriff's substation. At the Pomona Metrolink Station, 143 new parking spaces were added in May 2010, and the passenger platform was lengthened in December 2010 to accommodate additional rail cars for the

San Bernardino Line. Finally, the new and expanded El Monte Transit Center was opened to the public in October 2012.

In general, the transit analysis relies on 3 three-month analysis periods. These were March – May 2011, March – May 2012, and March – May 2013. The same three months were used for comparative analysis in order to control for seasonal variation. This method is consistent with the method that was used in the transit analysis for the other UPA/CRD sites. The reason why the months March to May were chosen was because no key CRD events occurred during them. Table 3-15 shows how the three analysis periods situate in comparison to the CRD-funded improvements. The Baseline Analysis Period is the period prior to any CRD funded improvements. The Intermediate Analysis Period is the period after some of the CRD funded transit improvements were in place but prior to tolling. The Post-Toll Analysis Period is the period after the rest of the CRD funded transit improvements were in place and after tolling began on I-110 and I-10. The purpose of dividing the analysis into three periods is to be able to distinguish the impact of the new CRD-funded transit service on ridership from the impact of the tolls.

Table 3-15. Analysis Periods.

Mar-May 2011	**Baseline Analysis Period**
June 2011	1st round of Silver Line service improvements
Mar-May 2012	**Intermediate Analysis Period**
June 2012	2nd round of Silver Line service improvements
Oct. 2012	Expanded El Monte Transit Center opens Gardena Transit improvements
Nov. 2012	I-110 ExpressLanes open Torrance Transit improvements
Dec. 2012	Foothill Transit improvements
Feb. 2013	I-10 ExpressLanes open
Mar-May 2013	**Post-Toll Analysis Period**

Source: Metro

3.3.1 Data Sources

All data for the transit analysis was provided by Metro. For ridership, the focus was on average daily peak period ridership in the peak direction. The peak periods were defined as 6:00 to 9:00 a.m. and 3:00 to 7:00 p.m. The peak direction on the I-110 is northbound in the morning and southbound in the afternoon. The peak direction on the I-10 is westbound in the morning and eastbound in the afternoon. Ridership on the I-110 was measured between the Harbor Gateway Transit Center on the south end and the 37th Street Station on the north end (this is the last station on the I-110 prior to downtown Los Angeles). Ridership on the I-10 was counted between El Monte Transit Station on the east end and Union Station on the west end. The ridership figures were taken from automated passenger counter (APC) data, boardings in the morning and alightings in the afternoon.

Bus travel times in the I-10 and I-110 ExpressLanes were derived from the Silver Line's automated vehicle location (AVL) system. Bus travel times on the I-10 ExpressLanes were measured between El Monte and Union Stations. Bus travel times on the I-110 ExpressLanes were calculated between Harbor Gateway Transit Center and Slauson Station. The latter station was used instead of 37th Street Station because the buses bypassed 37th Street Station from June 2010 to June 2011 due to construction for the Metro Expo rail line. Consequently, there was no AVL data for 37th Street.

Three on-board surveys of Silver Line riders were conducted. The first survey was conducted in June 2011 and was limited to the I-110 portion of the Silver Line. The second survey was conducted in October 2012 and included both I-110 and I-10 Silver Line riders. Both the 2011 and 2012 surveys were pre-toll. The third and final survey was conducted in October 2013 to measure post-toll attitudes. In the 2011 survey, 401 surveys were collected, and the margin of error was ± 4.8 percent at the 95 percent confidence level. In the 2012 survey, 593 surveys were collected, and the margin of error was ± 3.9 percent at the 95 percent confidence level. In the 2013 survey, 809 surveys were collected, and the margin of error was ±3.4 percent.

3.3.2 Performance and Travel-Time Data

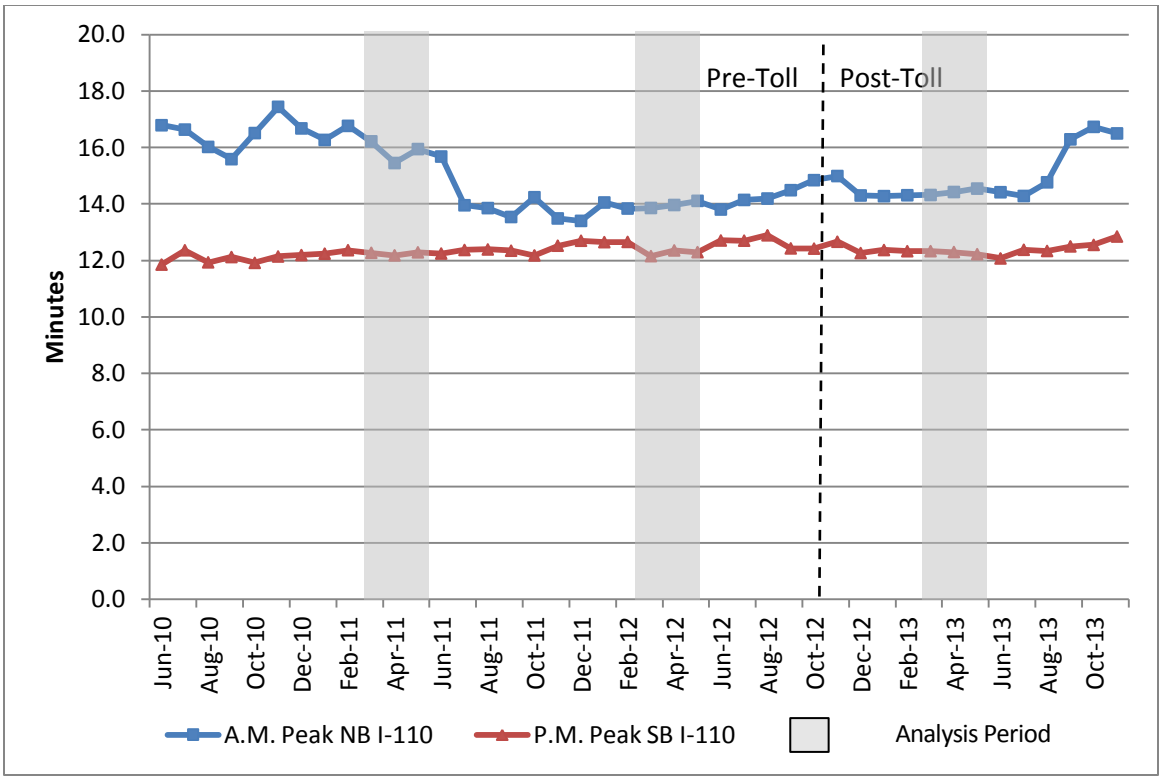
Table 3-16 shows the change in bus travel times on the ExpressLanes for the three analysis periods. On the I-110 ExpressLanes, morning peak period bus travel times decreased by 12 percent before tolls but then increased by 3 percent after tolls. There was no change in the afternoon peak period. A closer look at the data reveals that the morning travel times on the I-110 ExpressLanes were decreasing even prior to tolling (see Figure 3-24). On the I-10 ExpressLanes, morning peak period bus travel times increased by 4 percent before tolls and then fell by 11 percent after tolls. In the afternoon peal period, they increased by 10 percent before tolls but then fell by 16 percent after tolls. In general, bus travel times have decreased by 1.5 minutes from pre-deployment baseline to post-toll.

Table 3-16. Average Silver Line Travel Times.

	A.M. Peak NB I-110	P.M. Peak SB I-110	A.M. Peak WB I-10	P.M. Peak EB I-10
Baseline	15.9 min	12.2 min	17.6 min	16.6 min
Intermediate	14.0 min	12.3 min	18.2 min	18.2 min
Post-Toll	14.4 min	12.3 min	16.1 min	15.3 min
Percent Change (Intermediate)	-12%	0%	4%	10%
Percent Change (Post-Toll)	3%	0%	-11%	-16%

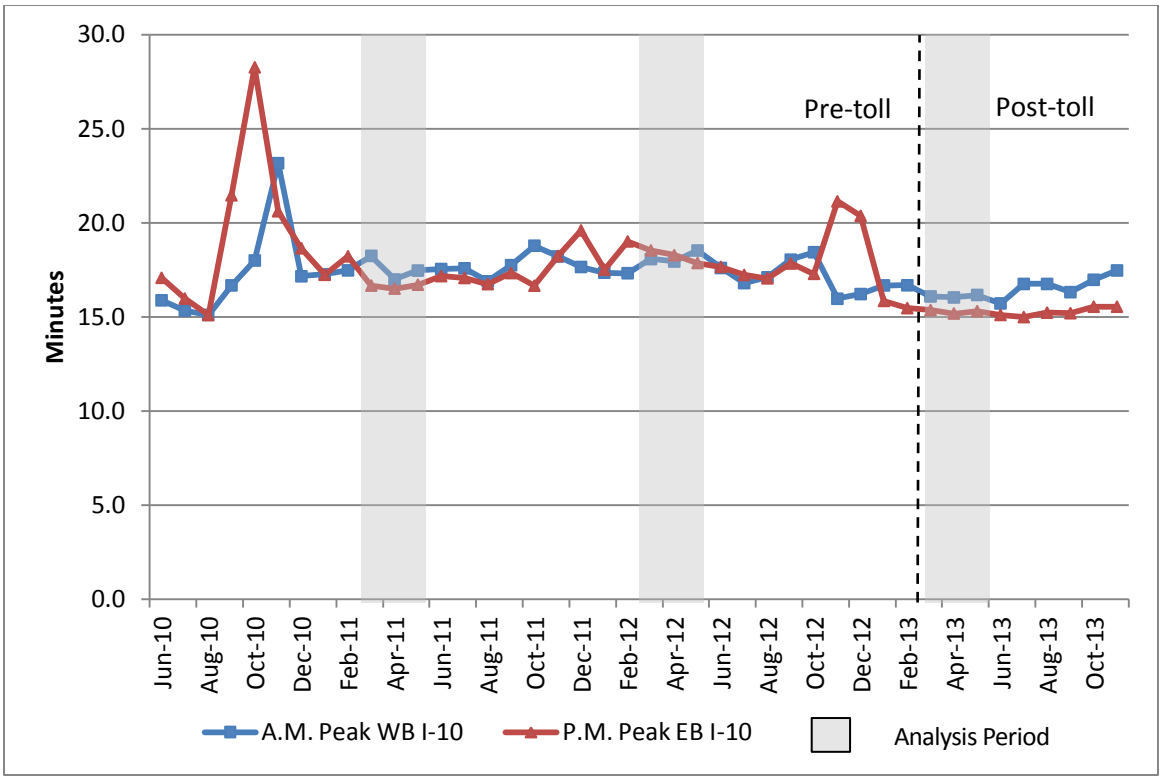
Note: Figures are 3-month averages (Mar-May 2011, 2012, and 2013)

Source: Metro



Source: Metro

Figure 3-24. Silver Line Travel Times on I-110 ExpressLanes.



Source: Metro

Figure 3-25. Silver Line Travel Times on I-10 ExpressLanes.

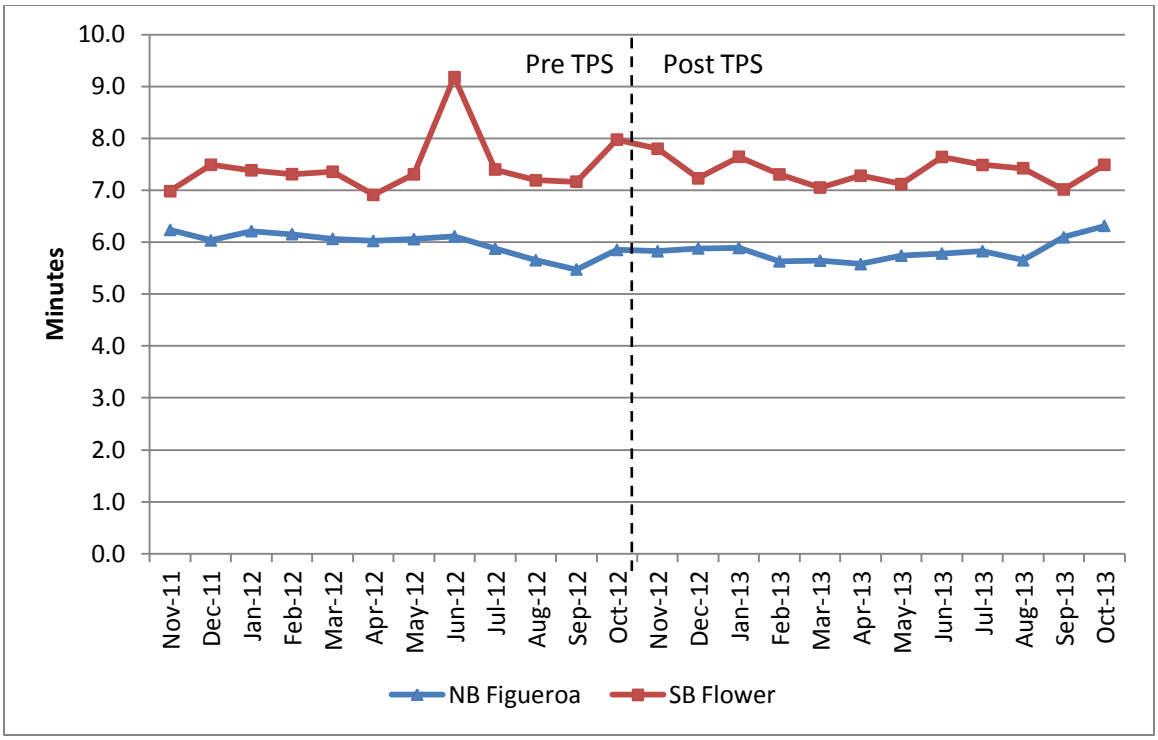
The TPS on Figueroa Street and Flower Street was activated on November 9, 2012. Travel time data was collected for northbound travel on Figueroa Street and southbound travel on Flower Street before and after the introduction of TPS. The same end points were used for both directions: Washington Boulevard and 7th Street (distance = 1.2 miles).

Table 3-17 compares the 12-month averages for pre- and post-TPS. On Figueroa, the 12-month average pre-TPS was 6.0 minutes and 5.8 minutes post-TPS. On Flower Street, it was 7.5 minutes pre-TPS and 7.4 minutes post-TPS. Figure 3-26 shows the average bus travel times from November 2011 to October 2013. The changes in travel time are so small as to not likely have been noticeable to riders.

Table 3-17. Average TPS Travel Times.

	AM Peak NB Figueroa	PM Peak SB Flower
Pre-TPS	6.0 min	7.5 min
Post-TPS	5.8 min	7.4 min

Note: Pre-TPS = 12-month average (Nov. 2011 to Oct. 2012)
Post-TPS = 12 month average (Nov. 2012 to Oct. 2013)
Source: Metro



Source: Metro

Figure 3-26. TPS Travel Times.

3.3.3 Transit Ridership Data

3.3.3.1 Silver Line

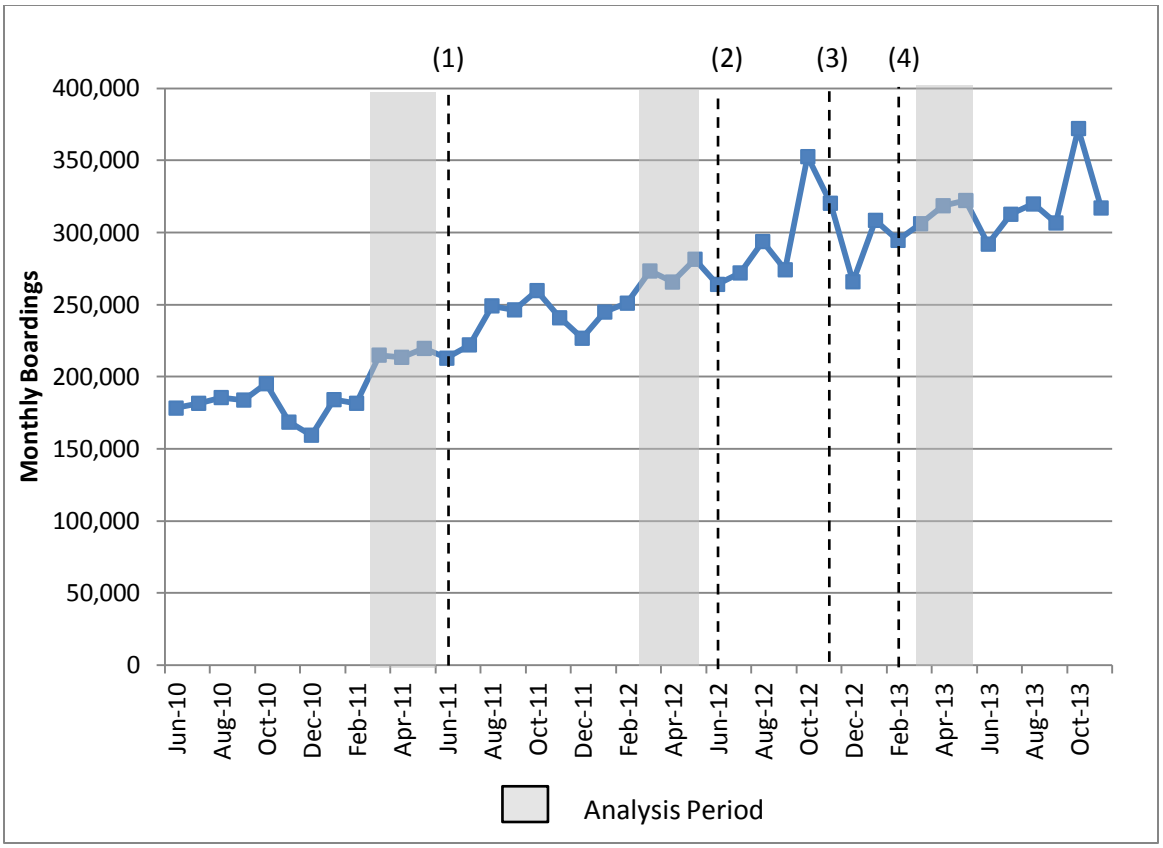
There was an overall 46 percent increase in monthly boardings on the Silver Line as shown in Table 3-18. Figure 3-27 shows the overall trend from June 2010 to November 2013. What the table and figure show is that the new CRD-funded transit service had a greater positive impact on ridership than the tolls. There was a 27 percent increase in Silver Line ridership after the new service was added but only a 15 percent increase after tolls. Also, the percentage growth on the Silver Line was higher than it was on Metro system-wide, which was close to zero.

Table 3-18. Monthly Boardings (Silver Line vs. Metro).

	Silver Line	Percent Change	All Metro	Percent Change
Baseline	216,029		30,014,784	
Intermediate	273,502	27%	29,724,628	-1%
Post-Toll	315,661	15%	30,057,352	1%
Total Percent Change		46%		0%

Note: Figures are 3-month averages (Mar-May 2011, 2012, and 2013)

Source: Metro



Notes: (1) June 2011, Peak period service on Silver Line increased from 30 to 15 minutes on I-110.
(2) June 2012, Peak period service on Silver Line increased from 15 to 10 minutes on I-110.
(3) November 2012, I-110 ExpressLanes open; tolling begins.
(4) February 2013, I-10 ExpressLanes open; tolling begins.

Source: Metro

Figure 3-27. Silver Line Monthly Boardings.

A closer analysis of the data revealed there was a greater percentage increase in ridership on the Silver Line's I-110 segment, although the I-10 segment still carries more average daily riders. This is not surprising given that it was the I-110 segment of the Silver Line that received the greatest improvement in service frequency. On the I-110 segment, average daily ridership increased 52 percent in the morning peak period and 41 percent in the afternoon peak period after the new service was added. It increased another 29 percent and 25 percent respectively after tolls. These findings help confirm that the CRD-funded transit service had a greater positive impact on ridership than the tolls alone.

Table 3-19. Silver Line Average Peak Period Ridership on I-110.

	Morning Peak Period	Percent Change	Afternoon Peak Period	Percent Change
Baseline	596		680	
Intermediate	907	52%	957	41%
Post-Toll	1,175	29%	1,199	25%

Note: Figures are 3-month averages (Mar-May 2011, 2012, and 2013)

Source: Metro

On the I-10 segment, average daily ridership increased 15 percent during the morning peak period and 7 percent during the afternoon peak period from the baseline to the intermediate period analysis period. During the post-toll analysis period, it fell by 5 percent in the morning peak period and stayed the same in the afternoon peak period as shown in Table 3-20.

Table 3-20. Silver Line Average Peak Period Ridership on I-10.

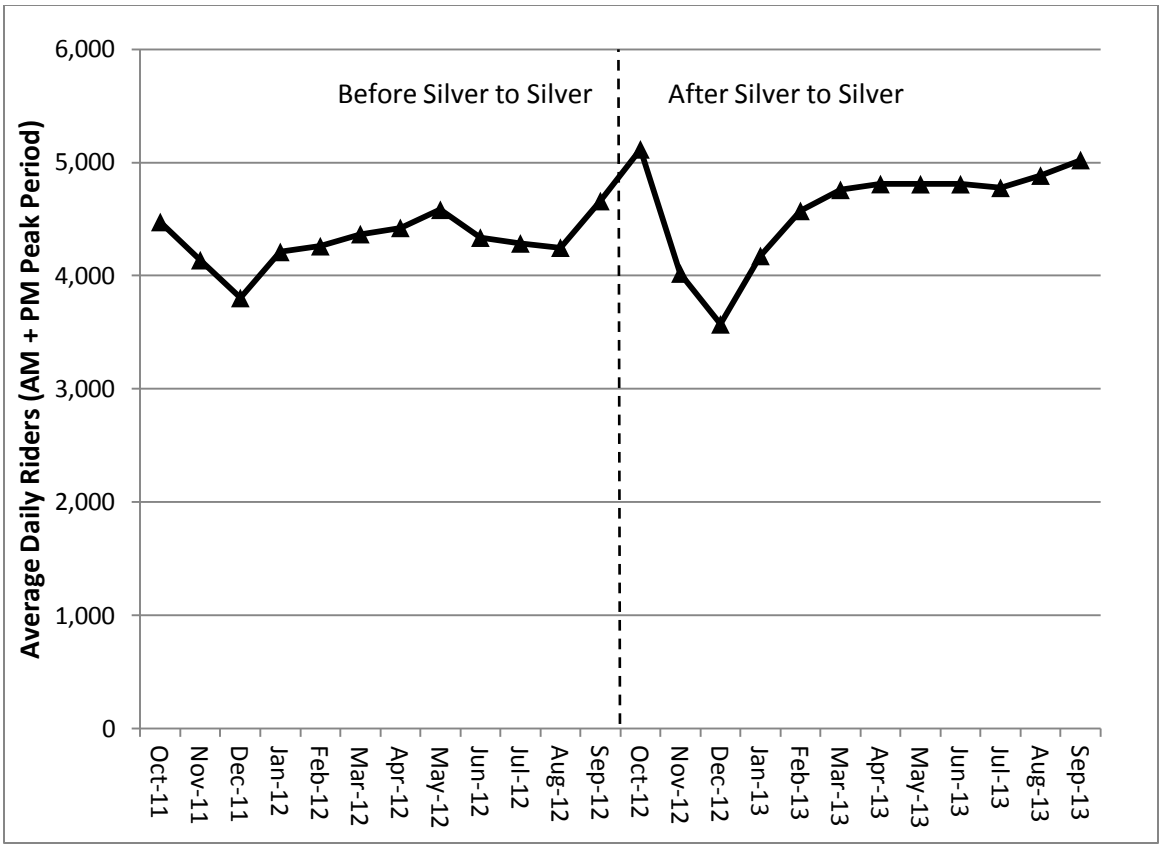
	Morning Peak Period	Percent Change	Afternoon Peak Period	Percent Change
Baseline	1,434		1,528	
Intermediate	1,642	15%	1,629	7%
Post-Toll	1,568	-5%	1,637	0%

Note: Figures are 3-month averages (Mar-May 2011, 2012, and 2013)

Source: Metro

3.3.3.2 Silver2Silver Program

The Silver2Silver Program began in October 2012 as a one-year demonstration project. It allows riders of the Silver Line and Silver Streak to ride either route at the same fare. In doing so, this results in a fare decrease to Silver Streak riders since previously the fare was substantially higher than the Silver Line. The purpose of the program is to maximize transit resources along the I-110 ExpressLanes. Although it is not part of the CRD, it has the potential to increase ridership in the I-10 corridor. Figure 3-28 compares ridership for the one year before Silver2Silver (Oct. 2011 to Sep. 2012) to the one year after Silver2Silver (Oct. 2012 to Sep. 2013). The ridership shown in the figure is for morning peak period plus afternoon peak period for the Silver Line and Silver Streak combined. There was a 7 percent increase in ridership



Source: Metro

Figure 3-28. Silver2Silver Program Ridership.

3.3.3.3 Foothill Transit

Foothill Transit received CRD funds to enhance service on the Silver Streak and the Route 699, both of which operate on the I-10 ExpressLanes. Unlike the Silver Line enhancements, which were phased in well in advance of tolling, Foothill Transit introduced their CRD service enhancements just two months prior to tolling on I-10 (the CRD service was added on December 16, 2012 and the I-10 ExpressLanes opened on February 23, 2013). Because the new service was added so closely to the start of tolls, it is difficult to parse how much of the change in ridership was due to each element. For the Silver Streak, CRD funds were used to add 13 more trips in the morning peak period and 8 more trips in the afternoon peak period. For the Route 699, CRD funds were used to add 4 additional trips in the morning peak period and 14 additional trips in the afternoon peak period.

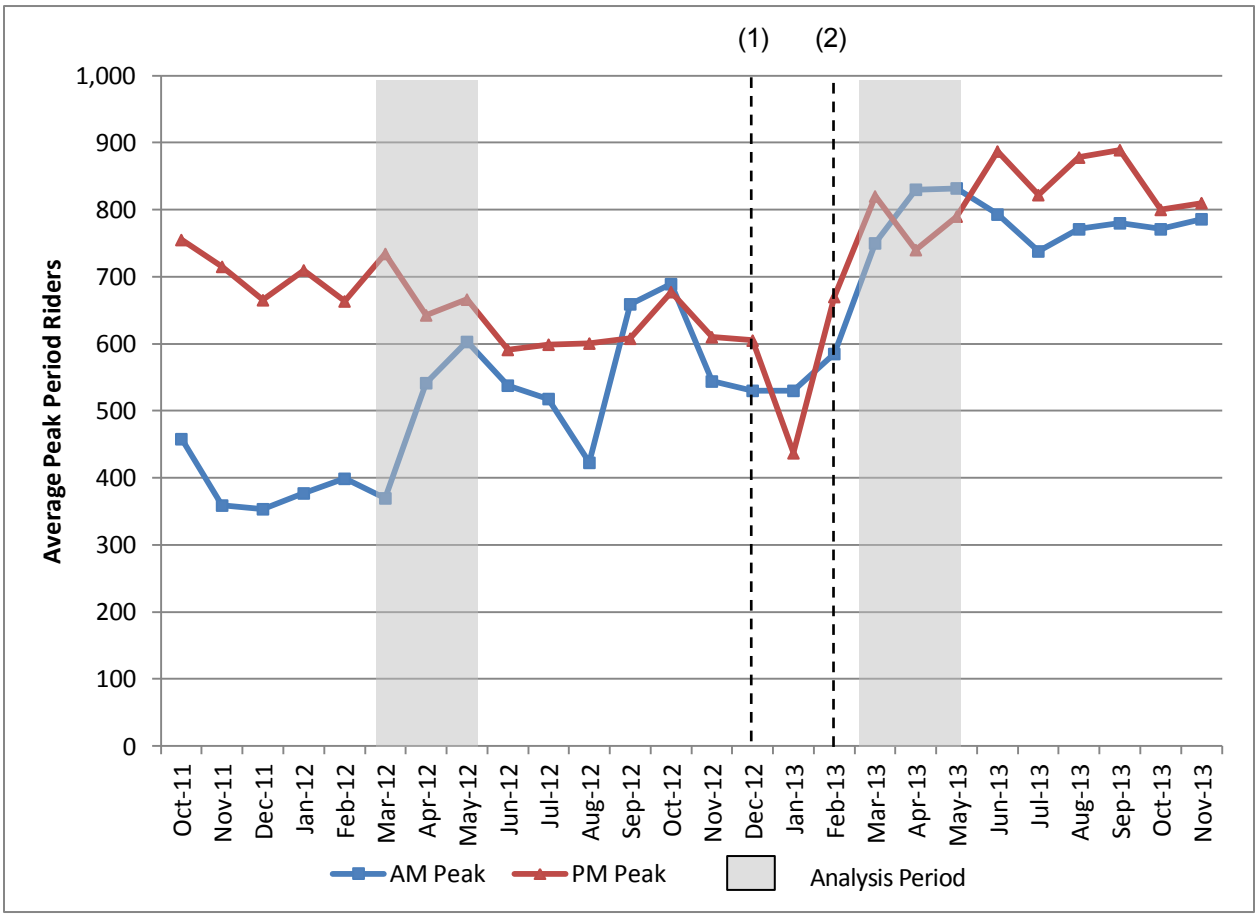
Peak period ridership on the Silver Streak increased 59 percent in the morning and 15 percent in the afternoon. It is unknown why there is such a difference in percentage growth between the morning and afternoon peak periods. It is possible that some riders take the Silver Streak into Los Angeles in the morning but make their return trip in the afternoon on the Silver Line.

Table 3-21. Silver Streak Average Peak Period Ridership on I-10.

	Morning Peak Period	Percent Change	Afternoon Peak Period	Percent Change
Intermediate	505		681	
Post-Toll	804	59%	783	15%

Note: Figures are 3-month averages (Mar-May 2012 and 2013)

Source: Metro



Note: (1) December 2012, CRD service added.

(2) February 2013, I-110 ExpressLanes open, tolls begin

Source: Metro

Figure 3-29. Silver Streak Average Peak Period Ridership on I-10.

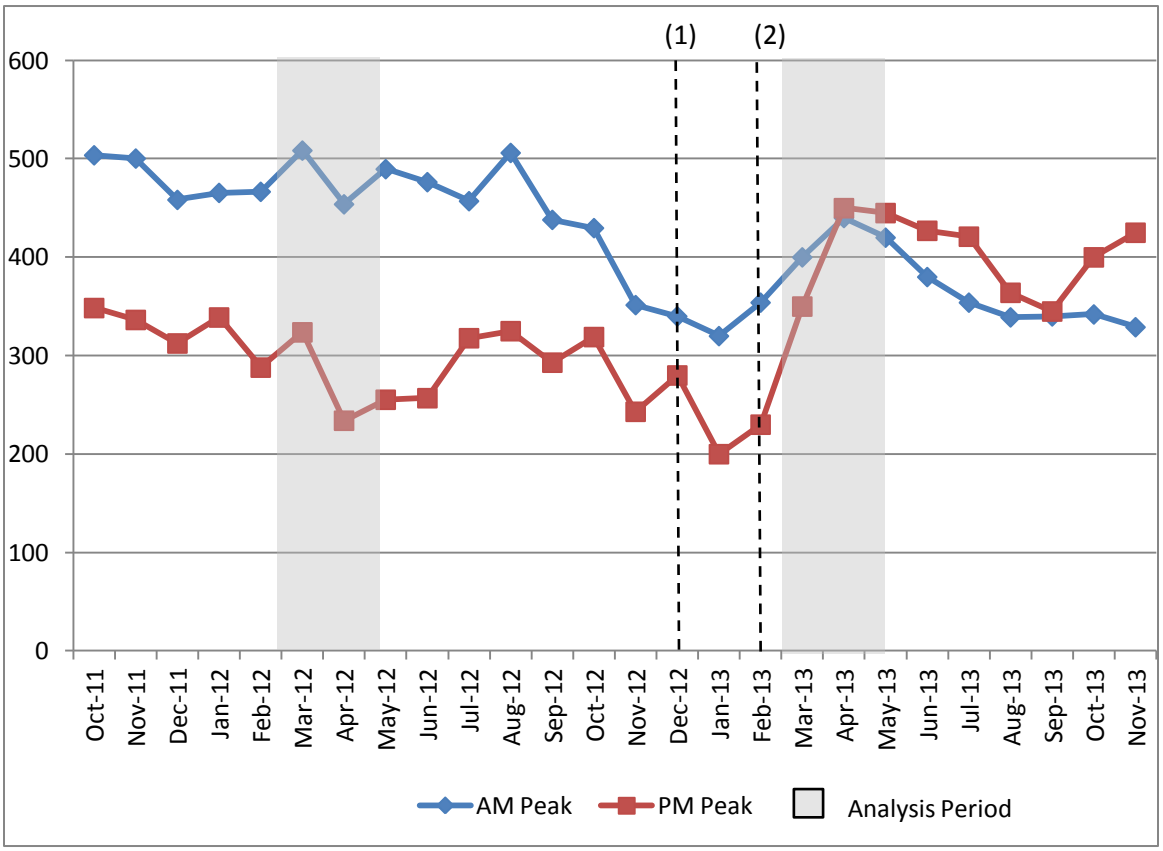
Peak period ridership on the Route 699 dropped by 13 percent in the morning peak period, but increased by 53 percent in the afternoon peak period. The drop in morning ridership may have been caused by riders using the Silver Streak for their morning commute but the Route 699 for their return trip in the afternoon. The "Silver 2 Silver" Program may have played a role also. Because the Silver2Silver Program reduced the fare on the Silver Streak, it would be more attractive to riders on than the Route 699.

Table 3-22. Route 699 Average Peak Period Ridership on I-10.

	Morning Peak Period	Percent Change	Afternoon Peak Period	Percent Change
Intermediate	484		271	
Post-Toll	420	-13%	415	53%

Note: Figures are 3-month averages (Mar-May 2012 and 2013)

Source: Metro



Note: (1) December 2012, CRD funded service added

(2) February 2013, I-10 ExpressLanes open, tolls begin

Source: Metro

Figure 3-30. Route 699 Average Peak Period Ridership.

3.3.3.4 Gardena Transit

Gardena Transit received CRD funding to add two more buses to the Line 1X and Line 2. The Line 1X is an express bus service to downtown Los Angeles that runs every 30 minutes and uses the I-110 ExpressLanes. The Line 2 is a feeder service that connects with the Silver Line at the Harbor Freeway Transit Station. The CRD service was added in October 2012, one month prior to the opening of the I-110 ExpressLanes. Peak period ridership on the Line 1X rose dramatically by 106 percent in the morning and 123 percent in the afternoon. Morning peak period ridership on the

Line 2 increased 3 percent, and afternoon peak period ridership increased 12 percent. Because the start of new service was so close to the opening of the ExpressLanes, it is difficult to ascertain how much of the increase was due to each element.

Table 3-23. Gardena Transit Average Peak Period Ridership.

		Morning Peak Period	Percent Change	Afternoon Peak Period	Percent Change
Gardena Line 1X	Intermediate	124		151	
	Post-Toll	256	106%	338	123%
Gardena Line 2	Intermediate	2,008		1,664	
	Post-Toll	2,059	3%	1,857	12%

Note: Figures are 3-month averages (Mar-May 2012 and 2013)

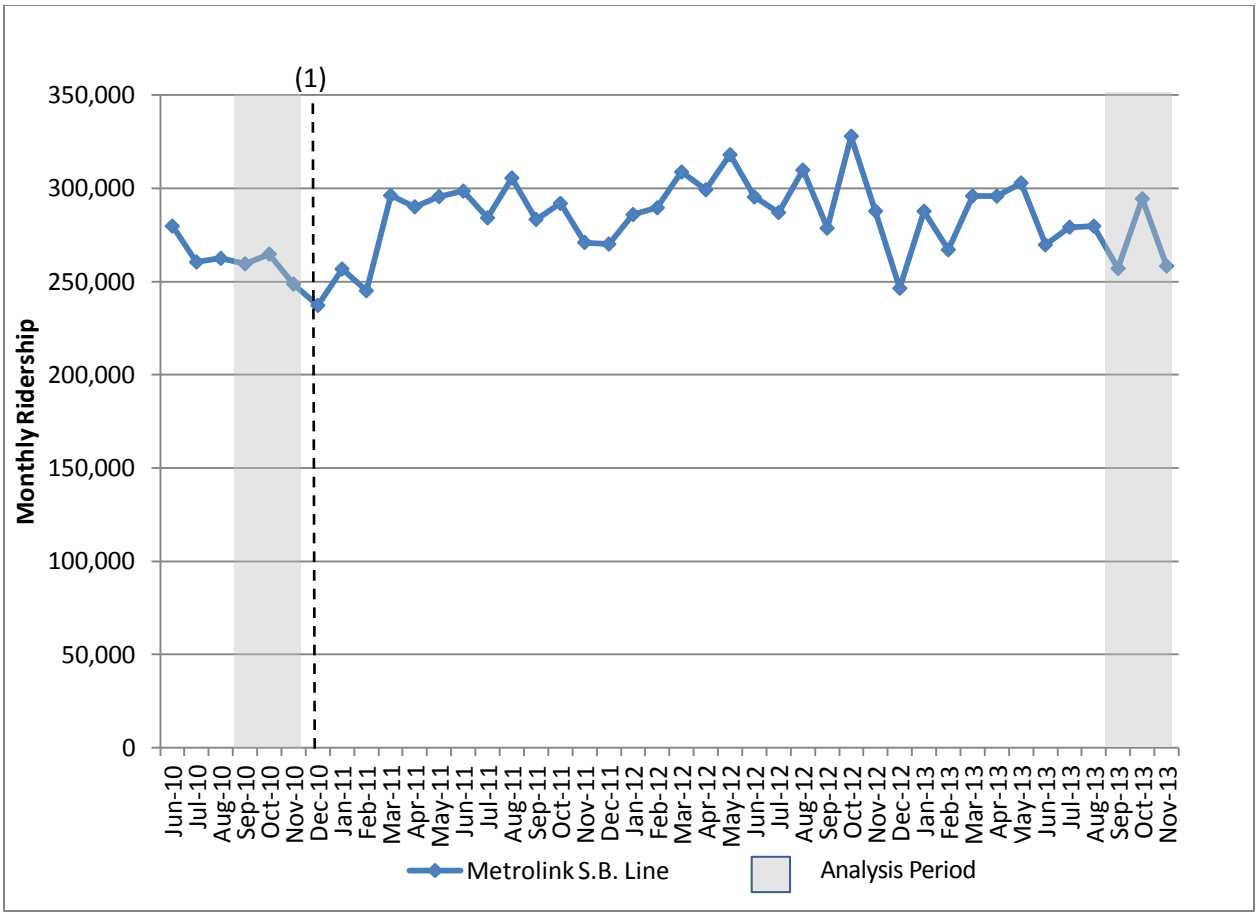
Source: Metro

3.3.3.5 Torrance Transit

Torrance Transit received CRD funding for four buses, which they used to start the new Line 4 from Torrance to downtown Los Angeles via the I-110 ExpressLanes. It replaces the Lines 1 and 2, both of which were truncated and no longer go to downtown Los Angeles. The Line 4 began at the end of October 2012, just prior to the opening of the ExpressLanes. Ridership data was not available at the time of this report, but will be included in the final report.

3.3.3.6 Metrolink

In December 2010, the platform at the Pomona (North) Metrolink station was extended to accommodate additional rail cars for the San Bernardino Line. The monthly trend in ridership from June 2010 to November 2013 is shown in Figure 3-31. When comparing the average ridership for three months prior to the improvements (Sep. - Nov. 2010) to the same three months in 2013, average monthly boardings are up five percent.



Notes: (1) December 2010, platform extended to accommodate longer trains
Source: Metro

Figure 3-31. Metrolink San Bernardino Line Monthly Ridership.

3.3.4 Park and Ride Lots

Seven park and ride lots were monitored for the evaluation. Five of them were on the I-110 at: Harbor Gateway Transit Center, Rosecrans Station, Harbor Freeway Station, Manchester Station, and Slauson Station. The sixth lot was on I-10 at El Monte Station. The seventh lot was the Pomona Metrolink Station. Table 3-24 shows the vehicle counts at the seven lots for the month of March in 2010, 2011, 2012, and 2013. Note that data on the I-110 lots was only available going back to 2012.

Several lots underwent changes in capacity (total spaces). The total number of parking spaces at the Pomona lot increased from 230 to 372 between 2010 and 2011. Between 2012 and 2013, total spaces at the Rosecrans lot decreased from 207 to 185, and total spaces increased from 803 to 823 spaces at the Harbor Gateway lot. Parking capacity at the El Monte lot changed multiple times due to construction.

At the Pomona Metrolink Station, more commuters are taking advantage of the increased capacity. Prior to the expansion, the lot was at capacity. In March 2010, all 230 spaces were occupied. In March 2013, 347 out of 372 spaces were occupied (93%).

More commuters are taking advantage of the increased capacity at the El Monte Station too. Prior to the expansion, the lot was nearly full. In March 2011, 1,099 of the 1,105 spaces were occupied (99%). In March 2013, 1,146 of the 1,419 spaces were occupied (81%).

At the lots in the I-110 corridor, the total number of occupied spaces increased 13 percent from 810 in March 2012 to 913 vehicles in March 2013. The lots at Harbor Gateway Station and Harbor Freeway Station were the two greatest sources of additional parked cars (77 and 25 respectively).

Table 3-24. Park and Ride Lot Occupancy (vehicles counted).

March 2010			
	Total Spaces	**Spaces Occupied**	**Percent Occupied**
Pomona Metrolink	230	230	100%
March 2011			
	Total Spaces	**Spaces Occupied**	**Percent Occupied**
Pomona Metrolink	372	351	94%
El Monte	1,105	1,099	99%
March 2012			
	Total Spaces	**Spaces Occupied**	**Percent Occupied**
Pomona Metrolink	372	347	93%
El Monte	1,134	1,120	99%
Slauson	160	10	6%
Manchester	127	33	26%
Harbor Freeway	253	133	53%
Rosecrans	207	33	16%
Harbor Gateway	803	601	75%
March 2013			
	Total Spaces	**Spaces Occupied**	**Percent Occupied**
Pomona Metrolink	372	347	93%
El Monte	1,419	1,146	81%
Slauson	160	7	4%
Manchester	127	41	32%
Harbor Freeway	253	158	62%
Rosecrans	185	29	16%
Harbor Gateway	823	678	82%

Source: Metro

3.3.5 Survey Results

Prior to the first survey in 2011, Metro made several safety-related improvements at the transit stations on I-110. All three surveys (2011, 2012, and 2013) asked riders to rate several aspects of station safety. Table 3-25 shows the changes in those ratings over the three years. The ratings are on a scale of 1 to 5 with 1 as the highest rating and 5 as the lowest. From 2011 to 2013, there were small degradations in the mean scores. An independent sample t-test revealed that none of the changes were statistically significant (i.e. the sig value was greater than 0.05). Overall, riders still rated the lighting at the stations as "Good" and their feeling of security as "Fair."

Table 3-25. Safety Ratings at Stations on I-110.

Station Feature	2011 Survey	2012 Survey	2013 Survey	Sig Value
Lighting in Stairwells	2.17	2.13	2.20	0.782
Lighting on Station Platforms	2.13	2.00	2.20	0.501
Lighting at Entrance to Station	2.13	2.07	2.21	0.443
Lighting in Elevators	2.25	2.24	2.38	0.285
Overall Feeling of Security	2.53	2.32	2.55	0.888

Scale: 1 = Very Good; 2 = Good; 3 = Fair; 4 = Poor; 5 = Very Poor

Scores are for I-110 stations only; responses from downtown and I-10 stations were filtered out.

Source: Metro

Further analysis was done to see if the responses differed between new riders and seasoned riders. New riders were defined as those who were first time riders and those riding for less than a year. Table 3-26 shows that the seasoned riders gave slightly better ratings than new riders on the lighting and their overall feeling of security. This could be because they are more aware of the changes that were made at the stations.

Table 3-26. Safety Ratings at Stations on I-110 (New vs. Seasoned Riders).

Station Feature	New Riders	Seasoned Riders
Lighting in Stairwells	2.27	2.18
Lighting on Station Platforms	2.30	2.13
Lighting at Entrance to Station	2.30	2.15
Lighting in Elevators	2.48	2.32
Overall Feeling of Security	2.66	2.51

Scale: 1 = Very Good; 2 = Good; 3 = Fair; 4 = Poor; 5 = Very Poor

Scores are for I-110 stations only; responses from downtown and I-10 stations were filtered out.

Source: Metro

In all three surveys, Silver Line riders were asked to rate various aspects of the service. Table 3-27 shows the ratings from the three surveys and also whether the change in rating from 2011 to 2013 was statistically significant. The ratings for frequency of service and hours of service both improved and were statistically significant. The rating for frequency of service improved from 2.14 to 1.90, and the rating for hours of service changed from 2.01 to 1.77. This survey finding is very relevant since a large portion of the CRD funds were used to reduce the headways on the I-110 portion of the Silver Line from every 30 minutes to every 10 minutes. The ratings for availability of seats and availability of parking both changed for the worse, and both changes were statistically significant. The rating for availability of seats degraded from 1.92 to 2.47, and the rating for parking availability degraded from 1.76 to 2.00. The drop in rating for these two categories may have been caused by the large increase in ridership on the I-110 portion of the Silver Line. In this case, the Silver Line may be a victim of its own success.

Table 3-27. I-110 Silver Line Customer Satisfaction Ratings.

Service Aspect	2011 Survey	2012 Survey	2013 Survey	Sig Value*
On time performance	1.78	1.70	1.88	0.214
Travel time	1.63	1.64	1.74	0.147
Hours of service	2.01	1.85	1.77	**0.004***
Frequency of service	2.14	1.94	1.90	**0.008***
Wait time at station/stop	2.14	1.99	2.10	0.642
Value of service for the price	2.05	1.87	2.11	0.520
Availability of seats	1.92	2.18	2.47	**0.000***
Parking availability at the Park n Ride lots	1.76	1.96	2.00	**0.005***
Ability to connect with other transit service	1.76	1.75	1.77	0.933
Overall satisfaction with this bus service	1.79	1.77	1.81	0.734

Scale: 1 = Very Good; 2 = Good; 3 = Fair; 4 = Poor; 5 = Very Poor

*Values in bold are statistically significant at the 95 percent confidence level.

An independent sample T test was performed comparing 2011 (baseline) to 2013.

Source: Metro

Table 3-28. I-10 Silver Line Customer Satisfaction Ratings.

Service Aspect	2012 Survey	2013 Survey	Sig Value*
On time performance	1.61	1.76	0.051
Travel time	1.52	1.76	**0.003***
Hours of service	1.67	1.82	0.076
Frequency of service	1.71	1.82	0.202
Wait time at station/stop	1.89	2.03	0.169
Value of service for the price	1.96	2.07	0.294
Availability of seats	2.33	2.41	0.484
Parking availability at the Park n Ride lots	2.31	2.15	0.148
Ability to connect with other transit service	1.64	1.84	**0.022***
Overall satisfaction with this bus service	1.63	1.80	**0.030***

Scale: 1 = Very Good; 2 = Good; 3 = Fair; 4 = Poor; 5 = Very Poor

*Values in bold are statistically significant at the 95 percent confidence level.

An independent sample T test was performed comparing 2012 and 2013.

Source: Metro

Table 3-28 shows the ratings given by Silver Line riders on the I-10 portion of the route. Since the 2011 survey was only conducted on the I-110 portion, the results for I-10 are limited to 2012 and 2013. There were slight degradations in ratings for nine of the ten categories although the degradations were statistically significant for only three of the categories (travel time, ability to connect with other services, and overall satisfaction with the bus service). The rating for travel time degraded from 1.52 to 1.76. The rating for ability to connect to other services degraded from 1.64 to 1.84. The rating for overall satisfaction degraded from 1.63 to 1.80. It is important to point out though that the ratings still fall within the category of "Good".

For both I-110 and I-10, it is important to point out that the surveys did not reveal a statistically significant improvement in customer satisfaction related to bus travel time. Although the rating still falls within the range of "good", it is important for policy makers to know that the conversion of the carpool lanes into tolled ExpressLanes did not cause a positive change in bus rider satisfaction with travel time.

The surveys asked riders how long they have been riding the Silver Line. Table 3-29 shows the results broken down by corridor. The percentage distribution was fairly similar with the exception that a higher percentage of Silver Line riders on I-10 have been riding for more than five years.

Table 3-29. How long have you been riding this bus route?

Response	I-110 Riders		I-10 Riders	
First time riding	19	7%	10	3%
Less than 6 months	53	19%	63	20%
6 months to 1 year	53	19%	53	17%
1-5 years	104	38%	105	34%
More than 5 years	43	16%	78	25%

Source: Metro

Riders were asked how they made their trip before they began taking the Silver Line. The results in Table 3-30 are limited to new riders, which are defined as first time riders and those riding for less than a year. The reason why the results are limited to new riders is to show how the CRD (both the new transit service and the lane conversions to tolled ExpressLanes) has influenced mode choice. About a third of the new riders in both corridors used to drive alone. Only a small percentage used to carpool.

Table 3-30. How did you make this trip before you began riding this route?

Response	I-110 Riders		I-10 Riders	
Always made this trip by bus	32	26%	39	33%
Carpooled	10	8%	6	5%
Other (specify)	12	10%	13	11%
Drove alone	39	32%	39	33%
Rode another bus	30	24%	23	19%

Note: Responses are for new riders only.

Source: Metro

Riders were asked whether they began riding the Silver Line before or after tolling. Table 3-31 shows that a greater percentage of I-110 riders began riding after tolling began (41% on I-110 versus 28% on I-10). A follow-up question asked whether the conversion of the carpool lanes into tolled ExpressLanes influenced their decision to ride the bus. The responses shown in Table 3-32 are limited to riders who began riding the Silver Line after tolling began. This is similar to how the question was analyzed in the other UPA/CRD evaluations. The logic here is that riders who began riding before tolls began had already made up their minds and therefore could not have been influenced by the tolls. The results show that among these "post toll" riders, a little more than one third of them said the lane conversion influenced their decision to take transit (37% on I-110 and 34% on I-10).

Table 3-31. Did you begin riding this bus before or after tolling began?

Response	I-110 Riders		I-10 Riders	
Before tolling started	148	59%	202	72%
After tolling started	101	41%	78	28%

Source: Metro

Table 3-32. Did the conversion of the I-10 and I-110 ExpressLanes influence you to ride this bus?

Response	I-110 Riders		I-10 Riders	
No	60	63%	46	66%
Yes	35	37%	24	34%

Note: Responses are limited to riders who said they started riding after tolls began.

Source: Metro

The survey asked riders how their travel time now compared to before tolling began. Table 3-33 shows that in both corridors, the majority of riders think their travel time has been faster since tolling began (65% on I-110 and 57% on I-10). Furthermore, one third of riders say their travel time now is 30 minutes faster or more. Two discrepancies in the data need to be addressed. First, there is a discrepancy between riders' perception of their travel time savings and the actual time savings recorded by the Silver Line's AVL system. Table 3-16 showed about a 1.5 minute reduction in travel time from the baseline pre-toll analysis period to the post-toll analysis period. This was measured using specific endpoints in the ExpressLanes. It is possible that riders were basing their perception of travel time savings on the entire length of their trip not just the portion on the ExpressLanes. Second, there is a discrepancy between riders' perception of travel time and their level of satisfaction with travel time. While the majority of riders reported travel time savings after tolls, the customer satisfaction rating for travel time dropped. A closer look at the data revealed that 680 riders answered the survey question related to customer satisfaction, but only 506 answered the travel time savings question. The survey questionnaire was worded in such a way that a rider was prompted to answer the travel times savings question only if he/she had answered the previous question which asked whether the conversion of the I-110 and I-10 carpool lanes influenced them to take the bus. In retrospect, the question on travel time change should have been asked of all riders.

Table 3-33. How does your travel time now compare to before tolls?

Response	I-110 Riders		I-10 Riders	
30 minutes faster or more	58	31%	61	29%
15-29 minutes faster	37	20%	31	15%
5-14 minutes faster	16	9%	18	9%
1-4 minutes faster	9	5%	8	4%
About the same	39	21%	63	30%
1-4 minutes slower	4	2%	2	1%
5-14 minutes slower	8	4%	12	6%
15-29 minutes slower	5	3%	6	3%
30 minutes slower or more	10	5%	8	4%

Source: Metro

The survey included two questions about attitudes toward the tolls. Riders were asked whether they thought the ExpressLanes have improved their travel and whether they thought the tolls were unfair to people on limited incomes. The results of the former question are shown in Table 3-34 and the results of the latter in Table 3-35. In both corridors, 48 percent of the riders agreed to varying extents that tolling the I-110 and I-10 ExpressLanes has improved their travel. Another 34 percent in both corridors were neutral. A smaller though not unsubstantial percentage (19%) disagreed to varying extents that tolling the ExpressLanes improved their travel. Whether these 19 percent meant that tolling the ExpressLanes has made no difference or made it worse is unknown. In regards to the issue of equity, slightly more than half agreed to varying extents that the tolls on I-110 and I-10 are unfair to people on limited incomes. In the I-110 corridor, it was 54 percent. In the I-10 corridor, it was 55 percent. About a third of the respondents in each corridor were neutral.

Table 3-34. Tolling the I-110 and I-10 ExpressLanes has Improved my Travel.

Response	I-110 Riders		I-10 Riders	
Strongly Agree	74	30%	79	27%
Agree	45	18%	62	21%
Neutral	84	34%	99	34%
Disagree	23	9%	24	8%
Strongly Disagree	24	10%	31	11%

Source: Metro

Table 3-35. The Tolls on the I-110 and I-10 ExpressLanes are Unfair to People on Limited Incomes.

Response	I-110 Riders		I-10 Riders	
Strongly Agree	85	36%	84	31%
Agree	43	18%	66	24%
Neutral	80	34%	84	31%
Disagree	15	6%	13	5%
Strongly Disagree	13	6%	27	10%

Source: Metro

Table 3-36 compares the demographics of Silver Line riders in the two corridors. In both corridors, slightly more than half are female. I-110 riders tend to be younger than I-10 riders. African-Americans and Hispanics comprise a larger percentage of the riders on I-110 than I-10. In regards to income, 61 percent of riders on I-110 and 58 percent of riders on I-10 have annual household incomes less than $35,000 a year. They qualify for the ExpressLanes Equity Plan, which is described in greater detail in the next section of the report. In both corridors, less than half of the riders have access to an automobile for their trip (48% of I-110 riders and 43% of I-10 riders).

Table 3-36. Demographics of Silver Line Riders.

Response	I-110 Riders		I-10 Riders	
Gender				
Male	119	47%	136	48%
Female	132	53%	150	52%
				Age
Under 18	10	4%	12	4%
18-24	87	33%	84	27%
25-34	44	17%	56	18%
35-44	43	17%	57	18%
45-54	44	17%	45	15%
55-64	23	9%	36	12%
65 or over	9	3%	20	6%
Racial/Ethnic Background				
African American/Black	73	37%	33	14%
Asian	33	17%	60	26%
American Indian/Alaskan Native	11	6%	12	5%
Caucasian/White	32	16%	48	21%
Other	49	25%	76	33%
Hispanic/Latino				
Yes	136	55%	120	42%
No	111	45%	167	58%
Annual Household Income				
Less than $10,000	67	33%	58	23%
$10,000 to $24,999	37	18%	64	26%
$25,000 to $34,999	20	10%	22	9%
$35,000 to $49,999	28	14%	25	10%
$50,000 to $74,999	21	10%	27	11%
$75,000 to $99,999	16	8%	19	8%
$100,000 to $149,999	5	2%	22	9%
$150,000 to $199,999	5	2%	6	2%
$200,000 to $249,999	1	0%	2	1%
$250,000 or more	3	1%	4	2%
Access to an Automobile				
No	139	52%	172	57%
Yes	126	48%	132	43%

Source: Metro

3.4 Equity Analysis

This analysis examined potential equity concerns associated with the ExpressLanes projects. It assessed whether the positive or negative effects of the ExpressLanes fell disproportionately on different user groups, as well as different geographic areas. Equity is of particular concern for the ExpressLanes because the corridors are adjacent to low income areas with high rates of poverty. Experience with pricing projects throughout the country indicates that perceptions of fairness, or equity, could be a key factor in the acceptance of transportation projects especially those involving the introduction of pricing. As such, this evaluation first examined the direct social effects of the projects on the persons who traveled through these areas. These social effects included potential travel-time savings and tolls paid by various user groups including drivers in the general purpose lanes, ExpressLanes, and transit. Second, the evaluation investigated potential impacts to those who live near the two corridors. The geographic distribution of FasTrak accounts and Equity Plans are examined alongside rates of poverty and median household income in the areas adjacent to the ExpressLanes corridors. Finally, the evaluation examined the planned reinvestment strategy of the revenues produced by the ExpressLanes with emphasis on the ways that it could affect different resident and user groups.

3.4.1 Data Sources

The equity analysis drew on data from several other analyses in the national evaluation. Travel times were obtained from the congestion analysis and transit analysis. The tolling analysis and Metro provided data on toll rates, tolling transactions, FasTrak accounts, and Equity Plans. The transit analysis also provided results of an on-board transit survey. Metro provided results from the Equity Plan Survey that was conducted in December 2013[7]. These data were supplemented with socio-economic data from the U.S. Census Bureau.

3.4.2 Potential Equity Impact on User Groups

The evaluation examined the potential variation of benefits and costs experienced by different users of the I-110 and I-10 before and after the implementation of the ExpressLanes. Owing to the ExpressLanes' anticipated improvements for travelers in the corridor, especially the cars and buses using the HOT lanes, it was reasonable to expect that some users might benefit more. At the same time, for those paying a toll, travel costs could be higher.

Data for assessing the equity impacts on user groups included average travel time drawn from the congestion analysis and transit analysis, average toll rates from the tolling analysis. Data on FasTrak accounts, Equity Plans, and the number of tolled and free HOV trips on the I-10 and I-110 ExpressLanes were provided by Metro. Also presented are the perceptions of equity or fairness of tolling on the I-110 and the I-10 based on questions included in the on-board transit survey, described in the transit analysis.

3.4.2.1 General Purpose Lanes and ExpressLanes Drivers

The congestion analysis and transit analysis present changes in travel time from the pre-deployment period to the post-deployment period. The congestion analysis shows changes in morning and afternoon peak period travel times on the I-110 general purpose lanes -0.02 to 1.67 minutes, respectively, compared with an increase of 1.89 and 0.11 minutes in the I-110 ExpressLanes. Morning and afternoon peak period travel times on the I-10 general purpose lanes changed by -1.89 and 4.31

[7] Metro. *Metro ExpressLanes Equity Plan Survey Analysis.* (2014).

minutes, respectively, with corresponding changes of -2.19 and -2.00 minutes in the I-10 ExpressLanes. Overall, peak bus travel times on the I-110 and the I-10 corridors decreased by 0.1 to 1.5 minutes after the ExpressLanes became operational. In conclusion, transit riders, general purpose lane users, and HOV users who remained in the same user group from the pre-deployment period to the post-deployment period experienced no major change.

Users receiving the greatest potential benefit from the ExpressLanes are single-occupant vehicle drivers that did not meet the HOV occupancy requirements in the pre-deployment period, but can now pay a toll to ride in the ExpressLanes. According to the congestion analysis, these users saw an average peak period travel time savings of 17.11 and 13.86 minutes on the I-10 and 12.80 and 7.81 minutes on the I-110 for the morning and afternoon peak periods, respectively. Of course, these users also paid a toll of $0.25 to $1.40 per mile. This could result in a total toll of $3.50 to $19.60 for the 14-mile I-10 corridor or $2.75 to $15.40 for the 11-mile I-110 corridor. This user group reflects an objective of the ExpressLanes, which is to provide an additional travel choice to I-10 and I-110 users, regardless of income.

3.4.2.2 Equity Plan Usage by Low-Income Drivers

The ExpressLanes is the first HOT lane operation to offer an Equity Plan for low-income commuters. Eligibility requirements are that the applicant be a Los Angeles County resident with an annual household income at or below two times the Federal poverty level (i.e., a total of $39,060 in 2013). Qualifying residents receive a $25 credit when they set up an account, which can be applied to either the transponder deposit or pre-paid toll deposit. The monthly $3 account maintenance fee is waived. As of the end of December 2013, a total of 4,201 Los Angeles County households were enrolled in the equity plan, accounting for $105,025 in toll/transponder credits. These individuals paid the same toll rates as other users. This program helped to enable lower-income single-occupant vehicle users to take advantage of the travel time savings offered by the ExpressLanes.

Data on FasTrak accounts, Equity Plans, and the number of tolled and HOV2 trips on the I-110 and I-10 ExpressLanes were provided by Metro for November 2012 through December 2013. Table 3-37 presents a side-by-side comparison of Equity Plans versus all FasTrak accounts regarding the number of accounts, total and average monthly single-occupant and HOV2 trips, and the average amount paid for tolled trips. The number of FasTrak accounts and Equity Plans continued to grow throughout the time period, as noted in the first two rows of Table 3-37, with Equity Plans representing over 2 percent of total FasTrak accounts. Average values presented in Table 3-37 are based on the trip totals for each month divided by the number of accounts in that month, in order to account for the growing number of FasTrak accounts.

The analysis shows that the average user with an Equity Plan made more monthly trips in the ExpressLanes, averaging 12.2 trips per month versus 10.6 trips per month for all users. Over 80 percent of trips taken by users with Equity Plans were toll-free trips (HOV3 on the I-10 during peak periods, and HOV2 on the I-10 for non-peak periods and the I-110 at all times), although Equity Plan users paid for an average of 2.4 tolled trips per month from November 2012 to December 2013. Overall, 55 percent of ExpressLanes trips were free trips by HOV2 users, with the remaining 44 percent of ExpressLanes trips being tolled single-occupant vehicles. The average user made almost twice the number of tolled ExpressLanes trips as an Equity Plan user, but almost half as many HOV2 trips as users with Equity Plans. Overall, Equity Plans accounted for only 1.2 percent of tolled trips on the I-10 and I-110 ExpressLanes, but 3.8 percent of free trips. Finally, single-occupant vehicles that made 8.7 million paid trips on the I-10 and I-110 ExpressLanes from November 2012 to December 2013, paying an average toll of $2.33, while a single occupant vehicle with an Equity Plan paid an average toll of $1.92 in that same period.

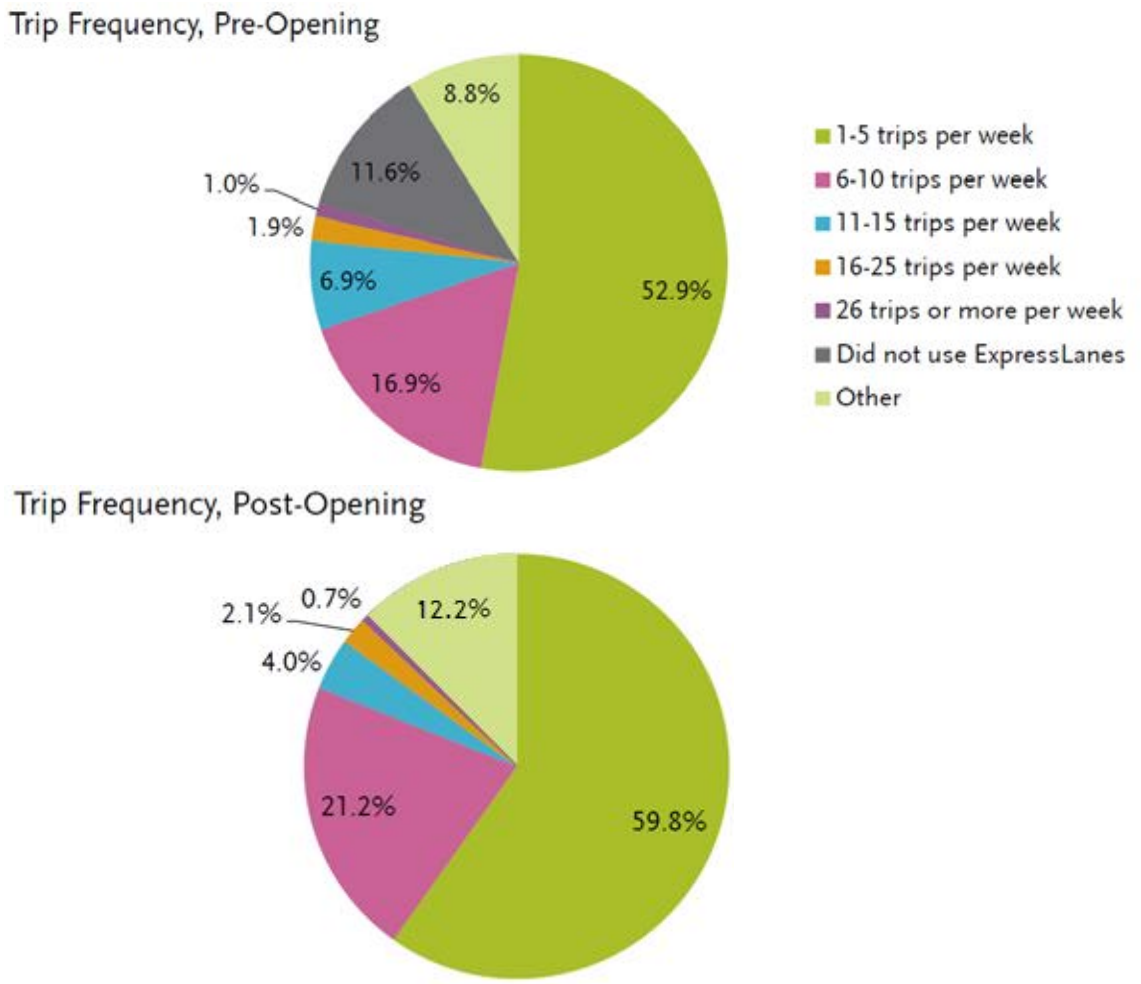
Table 3-37. ExpressLanes Trips by ExpressLanes Account Holders on the I-10 and I-110 for November 2012-December 2013.

	ExpressLanes FasTrak Accounts* (including Equity Plans)	Equity Plans only	
		Number	Percent of Total
Total Number of Accounts* (11/2012)	39,614	1020	2.6%
Total Number of Accounts* (through 12/2013)	197,703	4201	2.1%
Number of Tolled ExpressLanes Trips*	8,744,366	101,913	1.2%
Number of Free ExpressLanes Trips* (HOV3 on I-10 for peak periods, and HOV2 on I-10 for non-peak periods and I-110 at all times)	10,839,190	407,137	3.8%
Combined Tolled and Free ExpressLanes Trips*	19,583,556	509,050	2.6%
Average Tolled ExpressLanes Trips per Account per month*	4.7	2.4	51.1%
Average Free ExpressLanes Trips per Account per month* (HOV3 on I-10 for peak periods, and HOV2 on I-10 for non-peak periods and I-110 at all times)	5.9	9.9	167.8%
Average Combined Tolled and Free ExpressLanes Trips per Account per month*	10.6	12.2	115.1%
Average Amount Paid for a Tolled Trip*	$2.33	$1.92	(82.4%)

*Values include only ExpressLanes account holders and their trips on the ExpressLanes.

Source: Data from Metro

The Metro ExpressLanes Equity Plan Survey was sent to all Equity Plan account holders in December 2013. A total of 580 completed survey responses were received for a 17.4 percent return rate. The survey showed that the credit from the Equity Plan was very important for over 82 percent of the respondents in making the decision to get a FasTrak account to use the ExpressLanes. The reported number of trips taken before and after the opening of the ExpressLanes are shown in Figure 3-32 below. Finally, 87.7 percent of survey respondents reported an excellent or good experience with the ExpressLanes.



Source: Metro

Figure 3-32. The Reported Number of Trips taken by Equity Plan Users on the ExpressLanes in the Pre-deployment and Post-deployment Periods.

3.4.2.3 Transit

The transit analysis discusses results from a series of on-board transit surveys that were conducted by Metro, and are explained in more detail in the transit analysis. Specifically for the equity analysis, the survey included two questions about attitudes toward the tolls. Riders were asked whether they thought the ExpressLanes have improved their travel and whether they thought the tolls were unfair to people on limited incomes. In both corridors, 48 percent of the riders agreed to varying extents that tolling the I-110 and the I-10 ExpressLanes has improved their travel. Another 34 percent in both corridors were neutral. A smaller though not unsubstantial percentage (19%) disagreed to varying extents that tolling the ExpressLanes improved their travel. Whether these 19 percent meant that tolling the ExpressLanes has made no difference or made it worse is unknown. In regards to the second question, slightly more than half agreed to varying extents that the tolls on the I-110 and the I-10 are unfair to people on limited incomes. In the I-110 corridor, it was 54 percent. In the I-10 corridor, it was 55 percent. About a third of the respondents in each corridor were neutral.

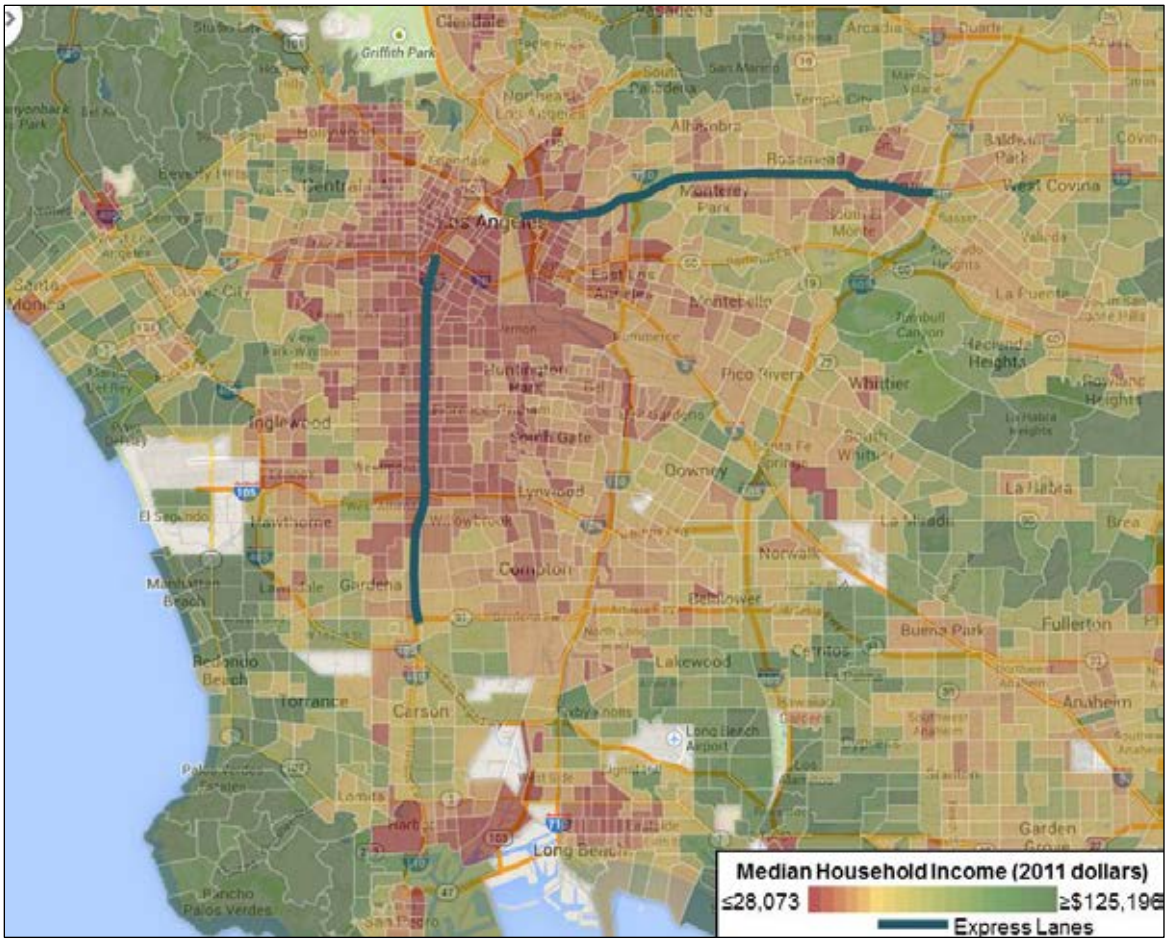
3.4.3 Potential Equity Impacts by Geographic Areas

Analysis of geographic equity sought to understand whether the impacts of the ExpressLanes, positive or negative, varied according to locations and, consequently, to the people living in those locations. Of course, the ExpressLanes program itself was designed to improve travel in a specific geographic area—the I-10 and I-110 corridors—and thus the question could be reframed to assess variation in impacts within parts of the corridor and elsewhere.

Potential impacts by geographic areas were assessed by examining the geographic attributes of users of the ExpressLanes. The transit analysis includes more details about new routes and ridership in the ExpressLanes corridors. Figure 3-33 and Figure 3-34 serve to illustrate the relatively low median household income and high rates of poverty present in the ExpressLanes corridors. As a result, many households in the ExpressLanes corridors also do not own a private vehicle.

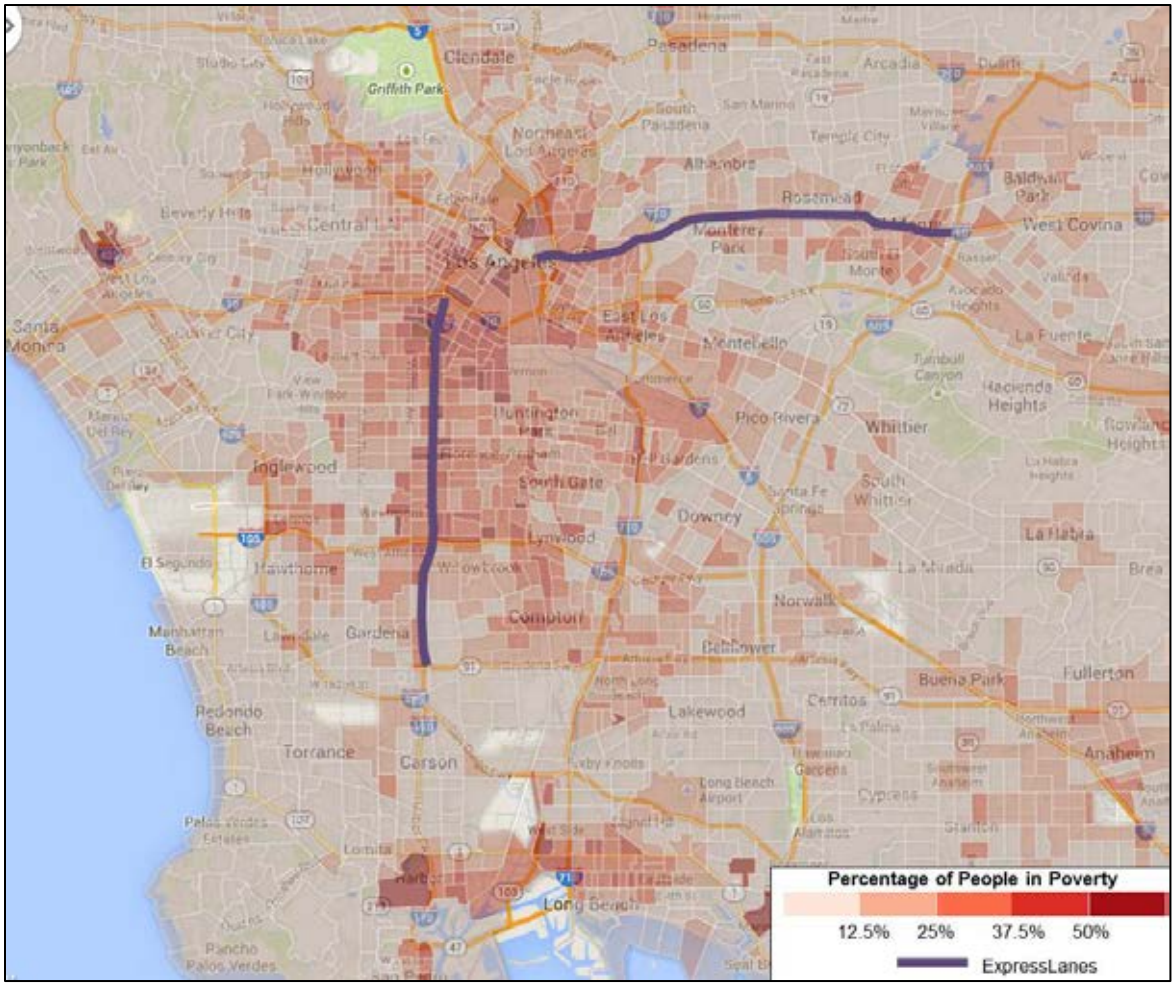
The spatial distribution of FasTrak accounts through February 2014 by ZIP code throughout the LA metro area is depicted in Figure 3-35. This map shows a very large number of FasTrak account holders to the southwest of the I-110 ExpressLanes corridor, with over 2000 accounts in most ZIP codes. A large number of FasTrak account holders are also present immediately north of the I-10 ExpressLanes corridor, with 500-2000 accounts in most ZIP codes there, as well as several ZIP codes with over 2000 accounts east of the I-10 ExpressLanes corridor. The number of FasTrak accounts shown in Figure 3-35 tends to be lower for areas that correspond to the areas having low median household incomes and high rates of poverty in Figure 3-33 and Figure 3-34, which might be expected given lower rates of car ownership in those areas. However, as might be expected, there also appears to be a high correlation between proximity to the ExpressLanes and the concentration of FasTrak accounts. Thus, the observed distribution of accounts may not necessarily be driven primarily by income.

Figure 3-36 is a map showing the spatial distribution of Equity Plan users through February 2014 as a percentage of the total FasTrak account holders by ZIP code. Closer examination reveals that higher percentages of Equity Plan accounts in Figure 3-36 tend to correspond with areas having low median household incomes and high rates of poverty in Figure 3-33 and Figure 3-34. In many cases, the areas with higher percentages of equity plans are in a lower income area where fewer individuals obtained a FasTrak account.



Source: Battelle with information from U.S. Census and Google Maps

Figure 3-33. Median Household Income by Census Tract in Areas Surrounding the ExpressLanes Corridors.

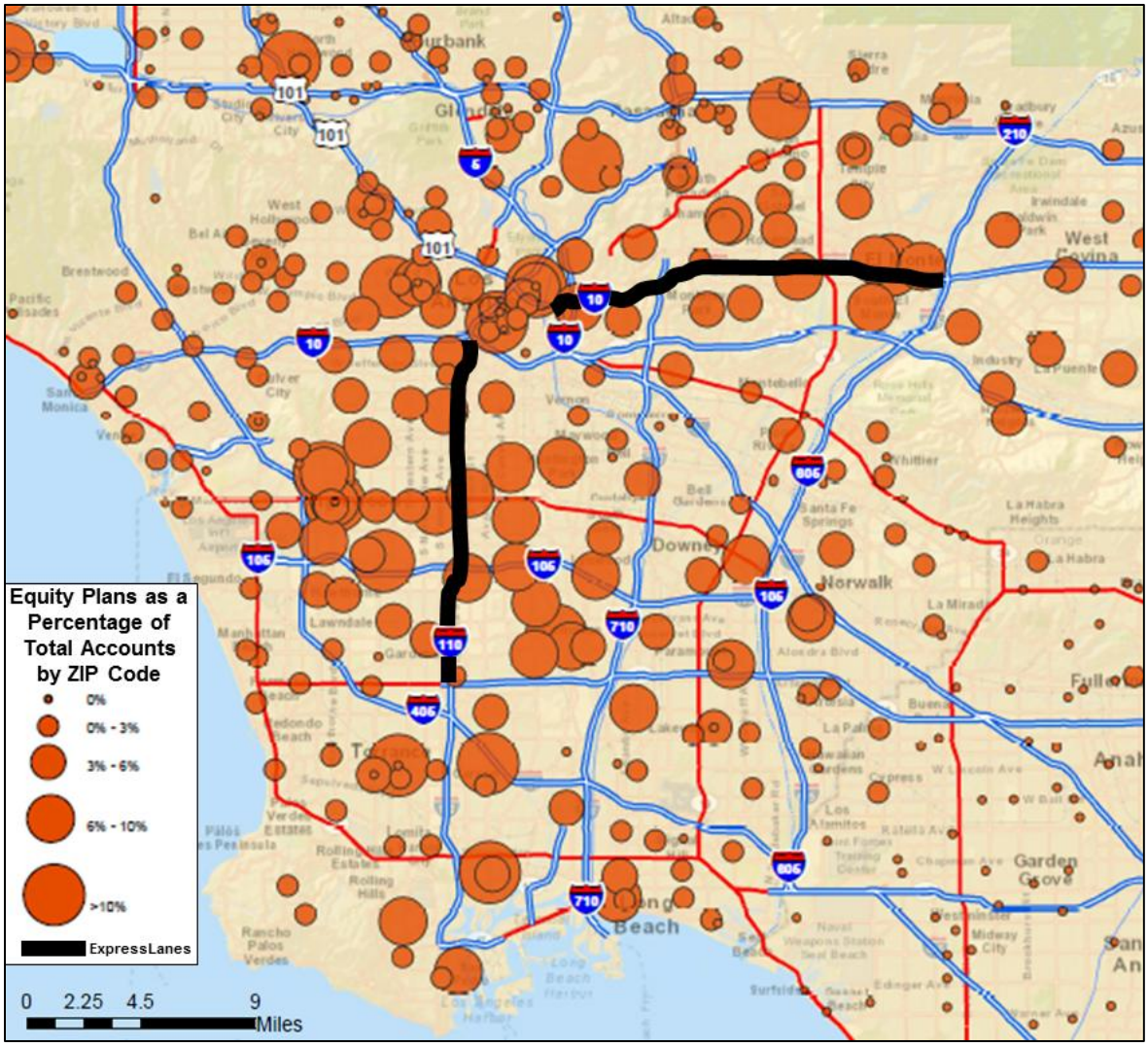


Source: Battelle with information from U.S. Census and Google Maps

Figure 3-34. Percentage of People Living in Poverty by Census Tract in Areas Surrounding the ExpressLanes Corridors.

Source: Battelle with information from Metro, Esri, DeLorme, NAVTEQ, USGS, Intermap, iPC, NRCAN, TomTom

Figure 3-35. Number of ExpressLanes FasTrak Accounts by ZIP Code.



Source: Battelle with information from Metro, Esri, DeLorme, NAVTEQ, USGS, Intermap, iPC, NRCAN, TomTom

Figure 3-36. Percentage of Equity Plan FasTrak Accounts by ZIP Code.

Table 3-38 shows cities with the highest numbers of ExpressLanes FasTrak accounts and Equity Plans through February 2014. The cities are organized by the highest percentage of FasTrak accounts that are Equity Plans. Any city that has more than 1500 total FasTrak accounts, 50 Equity Plans, or 3.0 percent of FasTrak accounts that are Equity Plans is presented in the table, with the top 10 for each category shown in **bold**. Los Angeles has the highest number of FasTrak accounts and Equity Plans, at 43,028 and 1431 accounts, respectively. At the east end of the I-10 ExpressLanes corridor, 10.6 percent of FasTrak accounts in South El Monte are Equity Plans, which is the highest percentage for any city. Overall, as of February 2014, Equity Plans account for 4408, i.e., 2.1 percent of the total 210,365 FasTrak accounts that were opened in the ExpressLanes corridor.

Table 3-38. Cities with the Highest Number of ExpressLanes FasTrak Accounts, FasTrak Equity Plans, and Percentage of ExpressLanes FasTrak Accounts that are Equity Plans.

City	Total ExpressLanes FasTrak Accounts	FasTrak Equity Plans	Percent FasTrak Accounts that are Equity Plans
SOUTH EL MONTE	502	53	**10.6%**
COMPTON	1670	**119**	**7.1%**
ROSEMEAD	1722	**119**	**6.9%**
LYNWOOD	569	37	**6.5%**
EL MONTE	2141	**137**	**6.4%**
INGLEWOOD	2259	110	**4.9%**
SOUTH GATE	500	24	**4.8%**
BALDWIN PARK	2192	104	**4.7%**
PARAMOUNT	384	18	**4.7%**
LA PUENTE	1966	87	**4.4%**
RESEDA	139	6	4.3%
WILMINGTON	727	31	4.3%
HAWTHORNE	2988	**118**	3.9%
GARDENA	**3945**	**154**	3.9%
MONTEREY PARK	1463	56	3.8%
CARSON	3081	**117**	3.8%
TEMPLE CITY	1326	48	3.6%
NORWALK	705	25	3.5%
LOS ANGELES	**43082**	**1431**	3.3%
HACIENDA HEIGHTS	607	20	3.3%
ALHAMBRA	2443	74	3.0%
SAN GABRIEL	2419	65	2.7%
WEST COVINA	**5396**	**122**	2.3%
SAN PEDRO	**3489**	77	2.2%
LONG BEACH	**6463**	**134**	2.1%
TORRANCE	**9869**	**202**	2.0%
COVINA	3377	67	2.0%
ARCADIA	2717	31	1.1%
GLENDALE	**4451**	46	1.0%
RANCHO PALOS VERDES	3451	34	1.0%
REDONDO BEACH	**6331**	62	1.0%
PASADENA	**5911**	46	0.8%
MANHATTAN BEACH	**5023**	16	0.3%
HERMOSA BEACH	2360	2	0.1%
RANCHO CUCAMONGA	2247	0	0.0%
SUBTOTAL: SELECTED LA AREA CITIES	137915	3793	2.8%
OTHER LA AREA CITIES	66945	615	0.9%
OTHER CALIFORNIA	4572	0	0.0%
OTHER US	933	0	0.0%
GRAND TOTAL	210365	4408	2.1%

Source: Battelle with data from Metro

3.4.4 Impact of Planned Re-investment of Potential ExpressLanes Revenue

One measure of equity is how revenues collected by the tolling system were used. For example, were revenues collected by ExpressLanes users applied to other transportation modes or facilities, or were these revenues used to subsidize certain groups of users of the ExpressLanes?

Metro's policy for reinvestment of ExpressLanes revenue is stated in a report entitled "Congestion Reduction Demonstration Program Net Toll Revenue Reinvestment Guidelines for the Pilot Period." Gross toll revenues from the ExpressLanes are first used to pay for maintenance, administration, and operation of the HOT lanes, including marketing, toll collection, and enforcement. All remaining revenue that is produced must be used in the respective corridor from which it was collected to provide a direct benefit for reducing congestion. A reserve fund will set aside 3 to 5 percent of revenues to cover unexpected costs on the ExpressLanes. A direct allocation of revenue will support the incremental transit service that was implemented to support the deployment of the ExpressLanes, which includes the Metro Silver Line, Foothill Silver Streak, Foothill Route 699, Gardena Line 1, and Torrance Transit Line 4. Net revenue remaining after these allocations is to be devoted to a combination of transit, system connectivity/active transportation, and highway improvements as presented in Table 3-39 below.

Table 3-39. Metro Reinvestment Targets for Toll Revenue Remaining after Allocations to Transit Service and a Reserve Fund.

	Baseline Target for Allocation	Select Examples
Transit Uses	40%	• Increased levels of service and/or increased service span • Fare subsidy programs • Purchase of new bus and commuter rail vehicles • Metro transit corridor projects serving ExpressLanes corridors
System Connectivity/ Active Transportation	40%	• First/last mile connections to transit facilities, focusing on multimodal elements that might support 3rd party solutions like car-share or bike-share • Complete streets projects that emphasize multimodalism • Bicycle infrastructure such as bicycle lanes and secured bicycle parking facilities • Pedestrian enhancements such as on/off-ramp safety improvements, street crossings, and ADA-compliance improvements • Bus station improvements such as enhanced bus shelters and real-time arrival information • Rideshare/Vanpool programs • Park-n-Ride facility improvements including restrooms, lighting, and security
Highway Improvements	20%	• ITS improvements to manage demand • On/off-ramp improvements to reduce the incidence of vehicle collisions with bicycle and pedestrians • Expanded freeway service patrol • Extension of the ExpressLanes corridors

Source: Metro, "Congestion Reduction Demonstration Program Net Toll Revenue Reinvestment Guidelines for the Pilot Period."

This policy for allocating net toll revenues for diverse and multimodal projects promotes a positive, equitable impact. Equity across geographic areas is promoted by re-investing toll revenue only within the corridor from which the revenue was collected. Investments for pedestrian, transit, vanpool, and fare subsidy programs support equity for low-income users in the corridors. Highway improvements will likewise support drivers that utilize the ExpressLanes. Multimodal investments support all user groups within the corridors by enhancing the quality and quantity of transportation options available and reducing congestion in the corridors to further improve the travel experience. Further, multimodal investments also reduce adverse air quality impacts in the corridor, thereby promoting environmental equity. In conclusion, given the information presented above, the Metro policy for re-investment of net toll revenues promotes equity.

Chapter 4. Summary of Findings

This technical memo is based primarily on the twelve months of post-deployment data following the deployment of the I-110 ExpressLanes (*November 2012 – November 2013*) and nine months of post-deployment data following the deployment of the I-10 ExpressLanes (late *February 2013 to December 2013*). Results are presented for four areas of analysis: congestion, tolling, transit, and equity. The findings are intended to provide an early indication of how the LA CRD projects are performing.

Although preliminary, the results described in this report suggest that the LA CRD projects are accomplishing many of their goals and objectives. Consistent with other new HOV/HOT conversion projects, the congestion data analysis shows degradation in travel times and travel speeds performance during the initial deployment period on some portions of the I-10 and I-110. However, consistent with other sites, the same facilities are showing an upward trend in travel time reductions and increases in speed in the later portions of the pilot period. The tolling analysis findings indicate that the number of trips on the ExpressLanes (by all groups) continued to increase over the course of the demonstration period, partially demonstrated by the increase in gross revenue from toll-paying vehicles. The many incentive programs proved to be successful with almost $13,000 in toll credits issued to Transit Rewards Program account holders and over $100,000 in toll/transponder credits issued to over 4,000 LA County households enrolled in the Equity Plan. In addition, the ExpressLanes program surpassed several of its goals including; enrolling over 100 new Metro-registered vanpools and issuing over 253,000 transponders by the end of the demonstration period.

Transit analysis findings indicate that Silver Line ridership increased largely due to CRD-funded services. The entire line (both I-110 and I-10) showed a 27 percent increase in monthly boardings after the new service was added with an additional 15 percent increase post-tolling. When surveyed, a third of new riders said they drove alone prior to the increased services and 48 percent of riders agreed that tolling has improved their travel. Additionally, the surveys showed an overall good level of customer satisfaction with transit services. Other LA CRD projects have also proven successful with commuters taking advantage of the increased parking capacity that has been offered. The equity analysis showed that Metro's re-investment of net toll revenues promotes equity. Findings showed that the number of FasTrak accounts and Equity Plans continued to grow throughout the post-deployment period and that Equity Plan users made more monthly trips in the ExpressLanes than overall ExpressLanes users. 80 percent of the trips made by Plan users were toll-free. In addition, when surveyed Equity Plan users felt that the credit provided was very important in making the decision to get a FasTrak account to use the ExpressLanes. More specific findings are summarized below.

4.1 Congestion Analysis

The congestion analysis assessed changes in traffic performance on the I-110 and I-10 ExpressLanes and general purpose lanes at the end of the one year demonstration period. Changes in travel times, trip speeds, and peak-hour vehicle and person throughput were included in this analysis.

Travel Time: Caltrans' floating car travel time studies were used to examine how vehicle travel times changed between the pre- and post-deployment evaluation periods. These studies were performed during the Spring, Summer, and Fall of 2012 and 2013.

Table 4-1. Changes in Travel Time After CRD Improvements (in mins).

Facility	Peak Period (Direction)	Express Lanes	General Purpose Lanes
I-10	Morning (WB)	-2.19	-1.89
	Afternoon (EB)	-2.00	4.31
I-110	Morning (NB)	1.89	-0.02
	Afternoon (SB)	0.11	1.67

Source: Caltrans

I-10 Travel Time: The results showed the I-10 ExpressLanes experiencing a 2 minute reduction in travel times during both the morning and evening commute periods (as shown in Table ES-1). Travel times in the general purpose lanes also declined by approximately 2 minutes during the morning commute, but increased by over 4 minutes during the evening commute in the post deployment period.

I-110 Travel Time: The results also showed that travel times in the I-110 ExpressLanes increased by approximately 2 minutes during the morning commute but remained near their pre-deployment levels in the evening commute. Morning commute travel times on the I-110 general purpose lanes remained close to pre-deployment levels. Travel times in the evening commute period in the southbound direction on I-110 remained close to pre-deployment levels, increasing by only 0.11-minutes on the ExpressLanes and by approximately 1.7 minutes in the general purpose lanes.

Travel Speed: The National Evaluation Team also examined changes in average travel speeds in the ExpressLanes and general purpose lanes between the pre-and post-deployment period

I-10 Travel Speed: Prior to the LA CRD improvements, ExpressLanes and general purpose lanes trip speeds averaged approximately 53 mph and 31 mph, respectively, in the westbound direction on I-10 during the morning commute. Following full deployment of the LA CRD improvements, average trip speeds on the general purpose lanes remained at 31 mph, while average trip speeds in the ExpressLanes increased above 55 mph. For the evening commute, trip speeds on I-10 in all lanes showed a slight improvement over pre-deployment levels.

Average Trip Speeds -- I-10

	Morning Commute Period (a.m.) -- Westbound															
	General Purpose Lanes								ExpressLanes							
Year	5:00	5:30	6:00	6:30	7:00	7:30	8:00	8:30	5:00	5:30	6:00	6:30	7:00	7:30	8:00	8:30
Pre- Deployment	NA	59	45	30	23	21	21	23	NA	64	60	57	48	40	53	52
Post- Deployment	NA	55	39	27	23	24	27	28	NA	66	62	61	60	58	58	59

	Afternoon Commute Period (p.m.) -- Eastbound															
	General Purpose Lanes								ExpressLanes							
Year	3:00	3:30	4:00	4:30	5:00	5:30	6:00	6:30	3:00	3:30	4:00	4:30	5:00	5:30	6:00	6:30
Pre- Deployment	28	26	27	25	25	26	29	36	46	44	41	43	47	49	49	51
Post- Deployment	27	25	23	21	24	23	28	35	54	50	48	47	48	49	53	59

Source: Texas Transportation Institute based on data provided by Caltrans

Average Trip Speeds -- I-110

	Morning Commute Period (a.m.) -- Northbound															
	General Purpose Lanes								ExpressLanes							
Year	5:00	5:30	6:00	6:30	7:00	7:30	8:00	8:30	5:00	5:30	6:00	6:30	7:00	7:30	8:00	8:30
Pre- Deployment	NA	62	40	25	18	19	21	25	NA	65	65	57	50	44	53	59
Post- Deployment	NA	55	35	27	20	20	21	24	NA	64	59	49	37	47	47	45

	Afternoon Commute Period (p.m.) --Southbound															
	General Purpose Lanes								ExpressLanes							
Year	3:00	3:30	4:00	4:30	5:00	5:30	6:00	6:30	3:00	3:30	4:00	4:30	5:00	5:30	6:00	6:30
Pre- Deployment	45	40	38	34	35	35	34	35	65	64	63	62	61	59	58	62
Post- Deployment	38	37	36	34	31	32	31	35	**65**	65	65	63	60	60	59	62

Source: Texas Transportation Institute based on data provided by Caltrans

I-110 Travel Speed: The analysis also found that average trip speeds in the general purpose lanes during the morning commute on I-110 decreased in the post-deployment period. The analysis showed that in the pre-deployment period, the ExpressLanes operated with average trip speed of less

than 45 mph from 7:30 to 8:00 a.m. In the post-deployment period, average trip speeds in the I-110 ExpressLanes operating near or below 45 mph from 6:30 a.m. to 9:00 a.m. In the evening commute, the ExpressLanes on I-110 continued to operate with relatively faster trip speeds compared to the general purpose lanes.

Throughput: The National Evaluation Team also examined the change in peak hour vehicle and passenger throughput in the post-deployment period. Caltrans vehicle occupancy counts provided a very limited set of data from which to investigate peak-hour vehicle and person-throughput.

Vehicle Throughput: From on the limited data samples available to the evaluation team, the analysis showed that total peak hour vehicle throughput remained relatively constant or increased slightly in both the I-10 and I-110 corridors in the post-deployment period. The analysis found that on both the I-110 and I-10 peak hour vehicle throughput in the ExpressLanes increased in the post-deployment period.

Person Throughput: Also using the Caltrans vehicle occupancy counts, the National Evaluation Team also examined changes in peak hour person throughput between the two evaluation periods. The preliminary findings for this analysis showed that person throughput on I-110 in the northbound direction during the morning peak hour decreased by 12.4 percent in the post-deployment period. This reduction correlates with the reduction in vehicle travel times and trips speeds observed on I-110 for the morning commute. The data also showed that for the I-10, total peak period person throughput declined in the morning commute, but increased in the evening commute. It should be noted that during the evaluation study, I-10 was under construction, which may have caused some users to change how they used the facility. Additional analyses will be performed in the final report to explore better data sources for capturing the changes in vehicle and person throughput experienced in these corridors due to the CRD improvements.

Table 4-2. Change in Total Peak-Hour Vehicle Throughput.

Peak Period	Location	Total Peak-Hour Vehicle Throughput			
		Pre-Deployment	Post-Deployment	Change	% Change
I-10					
AM (WB)	Warwick	8598	7452	-1146	-13.3
	Jackson	5817	7125	1308	22.5
PM (EB)	Warwick	6759	6594	-165	-2.4-
	Jackson	7752	7558	-194	-2.5
I-110					
AM (NB)	Adams	8522	9209	687	-2.6
	Slauson	8182	8115	-67	-0.8
PM (SB)	Slauson	8639	9262	623	7.2

Source: Caltrans

Table 4-3. Change in Total Peak-Hour Person Throughput.

Peak Period	Location	Total Peak-Hour Person Throughput			
		Pre-Deployment	Post-Deployment	Change	% Change
I-10					
AM (WB)	Warwick	13148	10621	-2527	-19.2
	Jackson	11006	10170	-838	-7.6-
PM (EB)	Warwick	10467	10394	-73	-0.7
	Jackson	10728	11387	659	6.1
I-110					
AM (NB)	Adams	12410	12082	-328	-2.6
	Slauson	12256	10737	-1519	-12.4
PM (SB)	Slauson	13135	13111	-24	-0.2

Source: Caltrans

4.2 Tolling Analysis

The tolling analysis examined the expansion and conversion of the existing HOV lanes on the I-110 and I-10 corridors into HOT lanes. Information on the use of the I-110 ExpressLanes from November 2012 through December 2013 and the I-10 ExpressLanes from February 2013 through December 2013 is presented. Enforcement, toll transactions, toll rates, and toll revenues on the ExpressLanes are also discussed. A total of 204,155 accounts were opened during the 19-month period from July 2012 to January 2014, with 253,139 transponders issued, surpassing the goal of 100,000 active transponders by the end of the demonstration period.

The I-110 and I-10 ExpressLanes use FasTrak, an electronic toll data collection system allowing drivers to travel through designated FasTrak-only lanes without stopping. Individuals must have a switchable FasTrak transponder to travel as a toll-free carpool in the I-110 and I-10 ExpressLanes. Motorists set the transponder switch to the position corresponding with the number of occupants (1, 2, or 3+) before entering the lanes. The number of trips on the ExpressLanes by all groups – self declaring toll-free HOV2s /HOV3s, toll-paying HOV2s and SOVs, as well as vanpools, buses, motorcycles, and other exempt vehicles – increased over the course of the demonstration. The results indicate that the ExpressLanes are providing choices to travelers in the I-110 and I-10 corridors.

The Equity Plan, the Carpool Loyalty Program, the Transit Rewards Program, and the Vanpool Program provide additional incentives and benefits to ExpressLanes carpoolers, bus riders, and vanpoolers. As of the end of December 2013, a total of 4,329 Los Angeles County households were enrolled in the Equity Plan, accounting for $108,225 in toll/transponder credits. The Carpool Loyalty Program automatically enters ExpressLanes FasTrak account holders using the lanes as a carpooler into monthly drawings for gift cards. During the demonstration period, 520 gift cards were issued. The Transit Rewards Program allows frequent bus riders using their registered TAP card to earn a $5 toll credit by taking 32 one-way trips during the peak hours on the I-110 and I-1 ExpressLanes. During the demonstration period, 5,782 accounts were enrolled in the program, earning $12,870 in toll credits. A total of 117 vanpools using either or both the I-110 and I-10 ExpressLanes, were established from July 2012 through February 2014, surpassing the goal of 100 new vanpools.

Both electronic and manual visual enforcement are used on the I-110 and I-10 ExpressLanes. The FasTrak system records vehicles without an active transponder. After the initial 60- days of operation on the I-110 ExpressLanes and the I-10 ExpressLanes, when a grace period was in effect and no violation penalties were assessed, the violation rates on both facilities during the AM peak hour peak direction of travel ranged from 6 percent-to-7 percent. A combination of electronic monitoring and visual enforcement is used to address violations of the self-declared occupancy requirements by CHP officers providing extra enforcement on the I-10 and I-110 ExpressLanes during the morning and afternoon peak periods. During the demonstration period, the monthly number of verbal warnings on the I-110 ExpressLanes ranged from 57-to-133, with the monthly number of citations ranging from 108-to-201. On the I-10 ExpressLanes, the monthly number of verbal warnings ranged from 77-to-164, and the number of citations ranged from 113-to-226. The differences in the manual occupancy counts conducted by Caltrans and the self-reporting FasTrak transponder data are being examined in more detail by Caltrans and Metro.

The gross revenue from toll-paying vehicles not meeting the carpool occupancy requirements using the I-110 and I-10 ExpressLanes for the 14-month period from November 2012 through December 2013 reflects the changes in use of the ExpressLanes. Total gross revenues for the 14-month period were $16,157,700 on the I-110 ExpressLanes and $7,234,593 on the I-10 ExpressLanes, for an

overall total of $23,392,293. These figures do not include revenue from toll violations, violation penalties, and other fees.

4.3 Transit Analysis

The transit analysis evaluated the impact transit enhancements funded through the LA CRD Program had on ridership and whether it facilitated a mode shift to transit contributing to congestion mitigation. The analysis for this technical memo includes data from June 2010 to November 2013.

Analysis shows that bus travel times on both the I-10 and I-110 ExpressLanes improved by 1.5 minutes during the morning peak period. Since activation of the transit priority system (TPS) on Figueroa Street, bus travel times improved by 0.2 minutes and on Flower Street, travel times improved from 0.1 minutes post-TPS. The changes are small enough that it is not likely to have been noticeable to riders.

CRD funds were also used to enhance the service frequency of the Silver Line well before the start of tolls on I-110 and I-10. A significant finding of the transit analysis is that the enhanced service resulted in a mode shift which included a significant increase in Silver Line ridership. There was a 27 percent increase in monthly boardings on the Silver Line after the new service was added and another 15 percent increase after tolls were implemented, for the entire line (both I-110 and I-10). When restricting the analysis to just the I-110 portion of the Silver Line, which is where the new service was added, the results are even more dramatic. Average daily ridership in the morning peak period increased 52 percent after the new service and 29 percent after tolls. In the afternoon peak period, it increased 41 percent after the new service and 25 percent after the tolls were implemented.

The municipal transit operators introduced their new service close to the opening of the ExpressLanes. Therefore, it is difficult to distinguish how much of the increase in ridership on their routes was due to the new service and how much was due to the introduction of tolling. The Silver Streak, operated by Foothill Transit on I-10, saw a 59 percent increase in morning peak period ridership after tolling and a 15 percent increase in the afternoon peak period. The Route 699, also operated by Foothill Transit, saw morning peak period ridership drop by 13 percent but afternoon peak period ridership increase by 54 percent. The drop in morning riders may be due to shifting to the Silver Streak for the morning commute. Peak period ridership on the Gardena Transit Line 2, which is a feeder service into the Silver Line, increased 3 percent in the morning and 12 percent in the afternoon. At the time of this report, ridership data was not available for the Torrance Line 4 but will be included in the final report.

As a result of investments in park-n-ride lot expansions, at the Pomona Metrolink Station, more commuters are taking advantage of the increased parking capacity. In March 2010, prior to the expansion, all 230 spaces were occupied. In March 2013, 347 out of 372 spaces were occupied (93%). More commuters are taking advantage of the increased capacity at the El Monte Station too. In March 2011, 1,099 of the 1,105 spaces were occupied (99%). In March 2013, 1,146 of the 1,419 spaces were occupied (81%). At the lots in the I-110 corridor, the total number of occupied spaces increased 13 percent from 810 in March 2012 to 913 in March 2013. The lots at Harbor Gateway Station and Harbor Freeway Station were the two greatest sources of additional parked cars.

The evaluation included three surveys of Silver Line riders (2011, 2012, and 2013). A significant positive finding from the last survey (2013) was that about a third of the new riders said they used to drive alone. There were some changes in customer satisfaction that were statistically significant. On the I-110, there were statistically significant improvements in the customer satisfaction ratings for frequency of service and hours of service but also statistically significant decreases in the customer

satisfaction ratings related to parking availability and availability of seats. The latter two may have been caused by the increase in ridership. On the I-10, there were statistically significant decreases in the customer satisfaction ratings for travel time, ability to connect to other services, and overall satisfaction. However, in all three categories, the ratings still fell within the range of "Good". Among Silver Line riders who began taking the bus after tolling started, a little more than a third said the ExpressLanes conversion influenced them to take transit (37% on the I-110 and 34% on the I-10). A majority of riders report that their travel times have gotten shorter since tolling began (65% on the I-110 and 56% on the I-10). In both corridors, 48 percent agreed that tolling the I-110 and I-10 ExpressLanes has improved their travel. Another 34 percent were neutral. In regards to the issue of equity, slightly more than half agreed that the tolls on I-110 and I-10 are unfair to people on limited incomes. In the I-110 corridor, it was 54 percent. In the I-10 corridor, it was 55 percent. About a third of the respondents were neutral.

4.4 Equity Analysis

This analysis examined potential equity concerns associated with the ExpressLanes projects. It assessed whether the positive or negative effects of the ExpressLanes fell disproportionately on different user groups, as well as different geographic areas. When examining available findings to date, transit riders, general purpose lane users, and HOV users who remained in the same user group from the pre-deployment period to the post-deployment period experienced no major change.

Results from the Metro Equity Plan Survey showed that the credit from the Equity Plan was very important for over 82 percent of the respondents in making the decision to get a FasTrak account to use the ExpressLanes. Data on FasTrak accounts, Equity Plans, and the number of tolled and HOV 2+ trips on the I-110 and I-10 ExpressLanes showed that the number of FasTrak accounts and Equity Plans continued to grow throughout the post-deployment period. The analysis showed that users with an Equity Plan made more monthly trips in the ExpressLanes than overall ExpressLanes users, averaging 12.2 trips per month versus 10.6 trips per month for all users. However, over 80 percent of trips taken by users with Equity Plans were toll-free trips (HOV 3+ on the I-10 during peak periods, and HOV 2+ on the I-10 for non-peak periods and the I-110 at all times). Overall, Equity Plans accounted for only 1.2 percent of tolled trips on the I-10 and I-110 ExpressLanes, but 3.8 percent of free trips. Finally, single-occupant vehicles that used the ExpressLanes from November 2012 to December 2013 paid an average toll of $2.33, while a single occupant vehicle with an Equity Plan paid an average toll of $1.92 in that same period.

When examining the spatial distribution of FasTrak accounts by zip code throughout the LA Metro area, it is revealed that higher percentages of Equity Plan accounts tend to correspond with areas having low median household incomes and high rates of poverty. In many cases, the areas with higher percentages of equity plans are in a lower income area where fewer individuals obtained a FasTrak account.

Metro's policy for reinvestment of the ExpressLanes net toll revenues for diverse and multimodal projects promotes a positive, equitable impact. Equity across geographic areas is promoted by re-investing toll revenue only within the corridor from which the revenue was collected. Investments for pedestrian, transit, vanpool, and fare subsidy programs support equity for low-income users in the corridors. Highway improvements will likewise support drivers that utilize the ExpressLanes. Multimodal investments support all user groups within the corridors by enhancing the quality and quantity of transportation options available and reducing congestion in the corridors to further improve the travel experience. Further, multimodal investments also reduce adverse air quality impacts in the corridor, thereby promoting environmental equity. In conclusion, given the information presented above, the Metro policy for re-investment of net toll revenues appears promotes equity.

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4.5 Next Steps

This technical memorandum focused on four of the eleven analysis areas that will be included in the final report due out in fall 2014. When evaluating these analysis areas, the team is aware that the effectiveness of the LA CRD strategies may be affected by exogenous factors. These factors include unemployment rates, gasoline prices, atypical travel conditions, and non-CRD transportation system changes. The final report will include a comprehensive analysis of the impact of these external factors. The National Evaluation Team found that, thus far, throughout the evaluation period gasoline prices have experienced minor fluctuations with a slight upward trend in cost and a slow decreasing trend in the unemployment rate for the LA metro area. In the final report, the changes in gasoline prices and unemployment rates will be overlaid against travel (i.e., traffic volumes, VMT) to see if both the travel data and the gas prices and unemployment rates follow similar trends. In addition, since the post-deployment period ended, the National Evaluation team began collecting data for the remaining two exogenous factors for assessing their impact on the LA CRD projects in the final report.

The LA CRD Program strategies were intended to improve overall system performance across the I-10 and I-110 corridors using tolling, transit, technology and travel demand management strategies. Although preliminary, the results described in this report suggest that many of the strategies deployed are accomplishing their goals and objectives. There remain areas where adjustments are warranted in an effort to improve performance. While the one year demonstration period recently ended, there are many policy related strategies that are yet to be considered for addressing the trends that have been identified through the data analysis on the two facilities. Over time, the local partners will work closely together to consider policies to apply to the ExpressLanes to further enhance performance

Acronyms and Abbreviations

4Ts	Tolling, Transit, Travel Demand Management, and Technology
ATMS	Advanced Traffic Management System
AVL	Automated Vehicle Location
Caltrans	California Department of Transportation (Caltrans)
CCTV	Closed-Circuit Television
CHP	California Highway Patrol
CRD	Congestion Reduction Demonstration
DMS	Dynamic Message Signs
FasTrak	ExpressLanes transponder used to electronically collect tolls
GPS	Global Positioning System
HOT	High Occupancy Toll
HOV	High Occupancy Vehicle
I-10	Interstate 10 (El Monte Busway between Alameda St and I-605)
I-110	Interstate 110 (Harbor Transitway between Adams Blvd and Harbor Gateway Transit Center)
IPM	Intelligent Parking Management
LA	Los Angeles
LADOT	Los Angeles Department of Transportation
Metro	Los Angeles County Metropolitan Transportation Authority
Metrolink	Southern California Regional Rail Authority
NB	Northbound
SB	Southbound
SBCCOG	South Bay Cities Council of Governments
SGVCOG	San Gabriel Valley Council of Governments
SOV	Single Occupant Vehicle
TPS	Transit Priority System
TTI	Texas Transportation Institute
U.S. DOT	United States Department of Transportation
UPA	Urban Partnership Agreement